DOCUMENT RESUME

ED 097 908 IR 001 281

AUTHOR	Borman, Karl G.
TITLE	Teaching and Coursewriting Language: TACL. User's Guide. Report No. R-64.
INSTITUTION	Pennsylvania State Univ., University Park. Computer-Assisted Instruction Lab.
PUB DATE	Oct 74
NOTE	177p.
EDRS PRICE	MF-$0.75 HC-$9.00 PLUS POSTAGE
DESCRIPTORS	*Computer Assisted Instruction; *Computer Programs; *Computers; Manuals; Programing; *Programing Languages
IDENTIFIERS	TACL; *Teaching And Coursewriting Language

ABSTRACT

The computer programing language, Teaching and Coursewriting Language (TACL), a language for computer assisted instruction curriculum development efforts on the IBM 1500 instructional system, is introduced. The guide supplies information on four major aspects of TACL: writing a TACL program, inputting a program into the computer, editing a program, and operating a program. The guide serves as a complete reference manual for all individuals who come into contact with TACL. (WH)

ED 097908

Teaching and Coursewriting Language:
TACL
User's Guide

Karl G. Borman

Report No. R-64

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

The Pennsylvania State University
The Computer Assisted Instruction Laboratory
University Park, PA. 16802

IR 001 281

October, 1974

TABLE OF CONTENTS

Page No.

- List of Figures . . . vii
- Preface . . . xi
- Acknowledgements . . . xv
- Chapter One - Introduction . . . 1
  - TACL Overview . . . 1
  - Flowcharting . . . 2
  - Overview of IBM 1500 Instructional System . . . 5
  - Coding Conventions . . . 11
- Chapter Two - Basic TACL Instructions for Authors . . . 15
  - Frame Identification . . . 15
  - Displaying Text . . . 16
  - Erasing The Screen . . . 16
  - Skipping To a Row . . . 16
  - Pause . . . 17
  - Control of Images . . . 22
  - Control of Audio Messages . . . 22
  - Requesting a Light Pen Response . . . 25
  - Requesting a Keyboard Response . . . 28
  - Branching Overview . . . 32
  - Unconditional Branches . . . 32
  - Conditional Branches . . . 33
  - Conditional Branches: Keyboard Response Evaluation . . . 38
  - Logical Operator Heirarchy . . . 41
  - Score Keeping . . . 56
  - Restrictions . . . 58
  - Variable Evaluation . . . 58
- Chapter Three - Advanced TACL Instructions . . . 63
  - Frame Identification . . . 63
  - Displaying Text . . . 64
  - Control of Images . . . 71
  - Control of Audio . . . 71
  - Analyzing Student Keyboard Response . . . 72
  - Identifying Student Responses . . . 77
  - Identifying Alternate Responses . . . 79
  - Score Keeping . . . 83
  - Inserting Coursewriter II Code . . . 87
  - TACL Problems & Limitations . . . 87
- Chapter Four - Inputting TACL Instructions . . . 89
  - Signing on to the Inputting Program . . . 89
  - Chapter Identification . . . 90

Page No.

Inputting TACL Instruction 90
Beginning A New Chapter 91
Inputting The FRAME Instruction 91
Inputting Text 92
Skipping Rows 92
Continuing Lines of Text 92
Changing Dictionaries 92
When Finished Inputting 93
To Sign Off 93
Cursor Placement 94
Correcting Errors During Input 94
Chapter Five - TACL Editing Instructions 113
Editing a Chapter 113
Adding Additional Material 114
Removing TACL Statements 114
Replacing TACL Statements 114
Relocating TACL Statements 115
Copying TACL Statements 115
Problems & Limitations 115
Chapter Six - TACL Operating Procedures 117
Preparing 1500 System For TACL Inputting 117
Operation I: Execute TCOPY 118
Function of TCOPY 118
Operation II: Execute TACL 119
Function of TACL 119
Number of Cards 120
END Record 120
Tape Handling & Printed Output 120
Notes 120
PSU Laboratory Procedures 124
Improper Terminations 124
Appendix A 127
Appendix B 129
Index 131

LIST OF FIGURES

Figure Page

1.1 Sample flowchart 3
1.2 The IBM 1500 instructional system 6
1.3 Sample TACL authoring sheet 7
1.4 Pagination sample 1 9
1.5 Pagination sample 2 10
1.6 Flowchart of figures 1.4 & 1.5 11
1.7 Sample image planning form 12
1.8 Sample audio message program sheet 13
2.1 Use of FRAME, PAUSE and SKIP instructions, sample frame 1 18
2.2 Sample frame 2 19
2.3 Sample frame 3 20
2.4 Flowchart of instructional strategy shown in figures 2.1, 2.2 & 2.3 21
2.5 Image planning form used with the strategy in figures 2.1, 2.2 & 2.3 23
2.6 Audio presented to student with image in figure 2.5 and the strategy in figures 2.1, 2.2 & 2.3 24
2.7 Sample audio instructions 26
2.8 Sample of lightpen instruction 27
2.9 Sample of keyboard instruction 29
2.10 Sample of keyboard insert (1) 30
2.11 Sample of keyboard insert (2) 31
2.12 Sample of lightpen IF and UN instruction 35
2.13 Sample of LABEL, ERASE, REPEAT, and GO TO instructions 36
2.14 Flowchart of instructional strategy shown in figures 2.12 & 2.13 37
2.15 Sample of keyboard IF instructions 39
2.16 Flowchart of instructional strategy shown in figure 2.15 (1) 40
2.17 Sample of CLASS instruction (2) 43
2.18 Continuation of figure 2.17 44
2.19 Flowchart of instructional strategy shown in figures 2.17 & 2.18 45
2.20 Sample of CLASS instruction 46
2.21 Continuation of figure 2.20 47
2.22 Continuation of figures 2.20 & 2.21 48

Figure Page

2.23 Flowchart of instructional strategy shown in Figures 2.20, 2.21 & 2.22 49
2.24 Sample of CLASS instructions (3) 51
2.25 Continuation of figure 2.24 52
2.26 Continuation of figures 2.24 & 2.25 53
2.27 Continuation of figures 2.24, 2.25, & 2.26 54
2.28 Flowchart of instructional strategy shown in figures 2.24, 2.25, 2.26 & 2.27 55
2.29 Sample of scorekeeping instructions 60
2.30 Continuation of figure 2.29 61
2.31 Flowchart of instructional strategy shown in figures 2.29 & 2.30 62
3.1 Standard dictionary 65
3.2 Math-science dictionary 66
3.3 Geometric dictionary 67
3.4 References for straight line segments 68
3.5 References for curved line segments 69
3.6 The dot dictionary 70
3.7 Sample EDIT instruction 74
3.8 Continuation of figure 3.7 75
3.9 Flowchart of instructional strategy shown in figures 3.7 & 3.8 76
3.10 Sample of response identification (1) 78
3.11 Sample of response identification (2) 80
3.12 Continuation of figure 3.11 81
3.13 Flowchart of instructional strategy shown in figures 3.11 & 3.12 82
3.14 Sample of IDENT instruction 84
3.15 Continuation of figure 3.14 85
3.16 Flowchart of instructional strategy shown in figures 3.14 & 3.15 86
4.1 Sample of inputting sequence (1) 96
4.2 Sample of inputting sequence (2) 97
4.3 Sample of inputting sequence (3) 98
4.4 Sample of CANCEL command (1) 99
4.5 Sample of CANCEL command (2) 100
4.6 Sample of FRAME inputting sequence 101
4.7 Continuation of figure 4.6 102
4.8 Sample of CLEAR command 103
4.9 Continuation of figure 4.8 104
4.10 Continuation of figures 4.8 & 4.9 105
4.11 Continuation of figures 4.8, 4.9 & 4.10 106
4.12 Continuation of figures 4.8, 4.9, 4.10 & 4.11 107
4.13 Sample of sign-off procedure 109
4.14 Continuation of figure 4.13 110
4.15 Continuation of figure 4.13 & 4.14 111
6.1 Flowchart of TACL operating procedure 123

PREFACE

An authoring language for the IBM 1500 Instructional System has been developed and implemented at The Pennsylvania State University's Computer Assisted Instruction Laboratory. The language, entitled Teaching and Coursewriting Language (TACL), was designed by Dr. Terry A. Countermine in partial fulfillment of the requirements for a Doctorate of Education in the Computer Science Department of The Pennsylvania State University.

TACL is an easy-to-learn language for computer-assisted instruction (CAI) curriculum development efforts. It is an English-language oriented, general-purpose CAI coursewriting language which is not only quick to learn, but also easy to use.

There are several reasons for the development of TACL. The most important factor is the amount of time required to develop an hour of CAI instructional material. With other coursewriting systems, approximately 100 hours of preparation time are required to produce one hour of student course material. TACL is designed to decrease the amount of preparation time to 50 or 60 hours for each hour of student course material. TACL produces the same high quality course which would have been produced using the current coursewriting system (Coursewriter II). Also, the ease with which TACL is learned leads educators, who would normally shy away from the technical problems associated with the computer, to realize that the computer and CAI are powerful tools which they can use to improve the quality of education.

TACL, a batch-processing type of compiler, allows input during the normal working day on the 1500 system by way of the Cathode Ray Tube terminal. As data are input via the keyboard, they are written onto magnetic tape and stored for later processing. The TACL requests are processed overnight and TACL listings are returned to the authors in the morning. Upon receiving the listings, the authors may use the editing facilities of the TACL system, to edit the chapter, and input those changes via the terminal keyboard. The procedure is repeated when the TACL author requests that his edited chapter be processed and he receives a new listing which reflects his changes.

While the TACL system continues to be used, new facilities are being added, and the reliability and the overall daily throughput are being increased.

This manual was designed to serve as a complete reference manual for each of the individuals who will come into contact with TACL. It is not necessary for every person to be familiar with each chapter. **Course authors** are urged to study chapters one and two. Chapters three and four may be considered as optional.

TACL programmers are urged to carefully study chapters one, two three and five. Chapter four may be considered as optional.

TACL inputters should carefully study chapters one, four and five. Chapters two and three may be considered as optional chapters for TACL inputters.

The **System's Staff** is urged to study chapter six and should be familiar with all of the other chapters.

Most of the examples contained in this manual were taken from *Sample Computer Assisted Instruction Student Interactions*, Report No. R-53 by K. A. Hall, G. P. Cartwright, C. A. Cartwright, H. E. Mitzel, and S. P. Wetcher. The reader of this manual is urged to refer to *Sample Computer Assisted Instruction Student Interactions* to examine the actual photographs of the student terminal containing the text.

ACKNOWLEDGMENTS

The development of TACL, a higher order authoring language for computer assisted instruction, could not be accomplished without the combined efforts and experience of a number of people. The work was initially started by Terry A. Countermine as a doctoral dissertation in computer science at Penn State. He drew upon the experience of many individuals from various facets of CAI operations in the CAI Laboratory at Penn State: Karl Borman, Terry Bahn, Phillip Cartwright, Lucille Diehl, James Watts, and Nancy Enteen. The product was further refined and developed for daily operational use in the Laboratory. James Watts, Karl Borman, and Terry Bahn had major responsibilities for doing this.

The users manual was written by Karl Borman and reviewed by James Watts, Terry Bahn, Lucille Diehl and edited by F. D. Dimmick.

Credit for the expert production of the manual goes to Vickie Anders and F. D. Dimmick.

CHAPTER ONE

INTRODUCTION

TACL Overview

Teaching and Coursewriting Language (TACL) is a programing language which is designed to reflect the steps used by teachers in designing and planning an interactive instruction lesson. The first step in the process is to formulate the overall objectives. For example, the overall objective may be to develop competencies in the area of educational measurement to enable a teacher to properly interpret test scores. The objective is sufficiently broad that a complete "chapter" could be devoted to the development of the objective.

Once the overall objective is formulated, specific objectives are formulated. A specific objective might be: when the student is given the heights of various children, he will be able to indicate each child's position on a bar graph. The material used to develop the concept of bar graphs is then organized into "frames" and presented to the student. A frame is all of the instruction that is presented to the student at one time.

After one or two frames have been used to present information to the student the teacher should present a question to the student to determine if he has understood the material. In order to evaluate the student's response, the teacher should list the possible answers that may be given by a student and the additional information that should be presented to the student to correct the misunderstanding. For example, the student might be asked to add 3 plus 2.

> If the student's answer is 6, he probably multipled and should be told the difference between multiplication and addition. After that information is presented, the student should repeat the frame.
>
> If the answer is 1, the student probably subtracted instead of adding and should be given additional information. After that information is presented, the student should repeat the frame.
>
> If his answer is 5, then the assumption is made that the child understands the concept of addition and should proceed to the next objective.

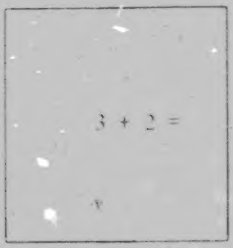
TACL is designed to reflect the steps outlined above.

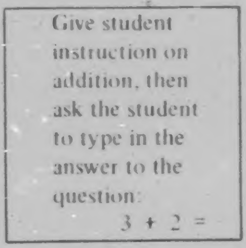
Flowcharting

As the author predicts the possible answers each student may provide in response to a question, the author may want to flowchart the instructional strategy that will be followed for each possible answer. A flowchart is a pictorial representation of the instructional strategy and may be either simple or complex depending on the expertise of the author. Authors just beginning to write tutorial CAI courses may find it useful to flowchart each frame during the early stages of their career. Later, they may find it necessary to flowchart only the more complicated frames. Only the basic flowcharting techniques will be covered in this manual.

Flowcharting Symbols. Four symbols are necessary to flowchart a frame.

A *rectangle* is used to define an instruction or a group of instructions which do processing in the course (e.g. present information to the student or keep track of the student's progress). The author can decide how much information is to be contained in each rectangle.




Give student instruction on addition, then ask the student to type in the answer to the question:
3 + 2 =

Arrows are used to indicate direction of flow. Generally flow is from top to bottom and left to right.

Diamonds are used to indicate decision points. At these points in the program decisions will have to be made as to which of *two* paths to follow. A diamond is used to represent a question at a decision point which can always be answered by true or false, or yes or no.

A **small circle** is used as a connector to identify an entry from or an exit to another part of the flowchart. The connector is used to unclutter flowcharts and to prevent many lines from crossing over another.[1]

---

[1] A more thorough explanation of flowcharting techniques may be found in Dwyer, Carol A., *Teaching Strategies and Tactics for Computer-Assisted Instruction.* Report No. R35. University Park: The Pennsylvania State University, Computer Assisted Instruction Laboratory, June, 1970.

Example:

The following example is a flowchart of the preceding illustration and the possible answers one might expect if a student is asked to add 3 plus 2:

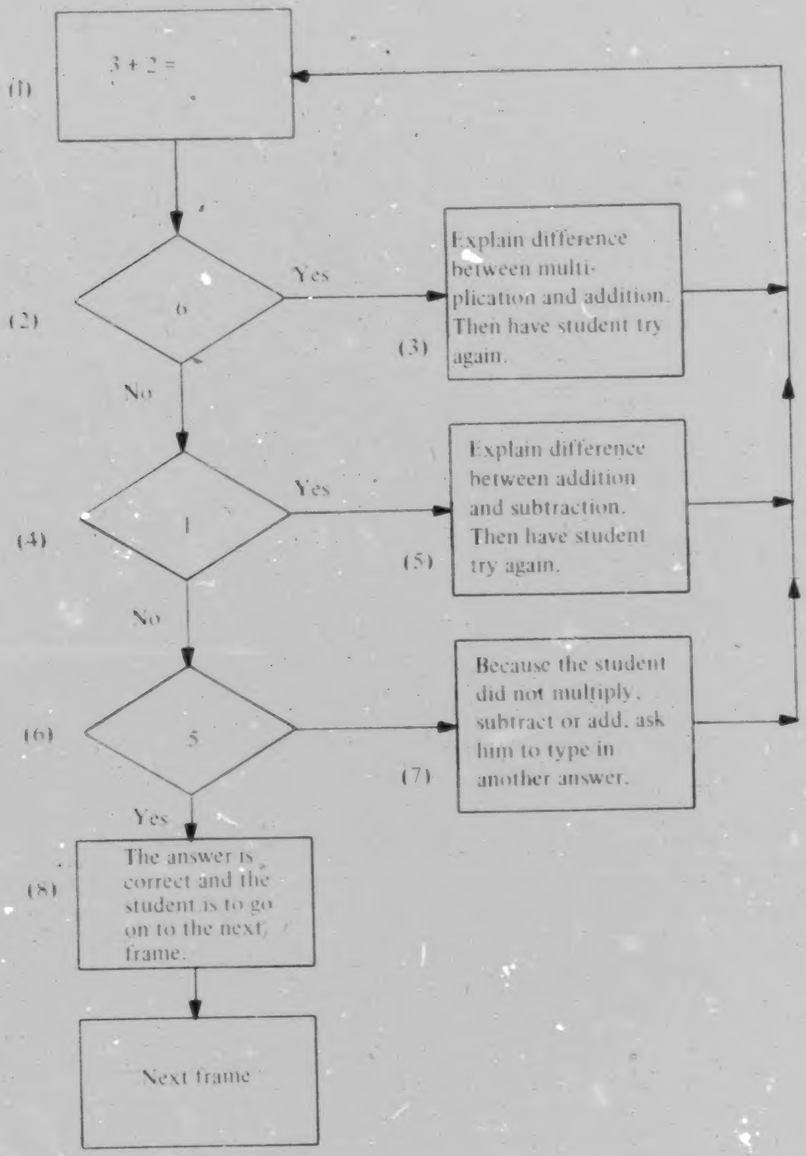

3 + 2 =
(1)
(2)
6
Yes
No
(3)
Explain difference between multiplication and addition. Then have student try again.
(4)
1
Yes
No
(5)
Explain difference between addition and subtraction. Then have student try again.
(6)
5
Yes
(7)
Because the student did not multiply, subtract or add, ask him to type in another answer.
(8)
The answer is correct and the student is to go on to the next frame.
Next frame

Figure 1.1. Sample flowchart.

For the purpose of illustration, assume that the student typed "6" after he was shown the question in block (1). The arrow from block (1) points to a decision block (2). The decision block (2) represents the question: "Is the student's answer 6?" Because his answer is an incorrect "6", the flow then proceeds to block (3) where the student is told the difference between multiplication and addition, after which the arrow points back to block (1) where he is asked to answer the question again.

If the student replies "1", the answer to the question represented by decision block (2) would be "No, the student's reply is not 6," the flow would then proceed to decision block (4). Decision block (4) represents the question: "Is the student's answer 1?" Since the answer to that question is "Yes", the flow then goes to block (5) where additional information is presented to the student, after which he again is presented with the question: 3 + 2 = .

If the student then types "5" he will proceed to decision block (2), then to decision block (4), then to decision block (6) since the answer to the questions at decision blocks (2) and (4) was "No". At decision block (6), the question is asked: "Is the student's answer 5?" Because it is, the student is told he is correct and he then proceeds to the next frame.

By this time it should be obvious that each decision block represents a possible ~~answer~~ and that the student's answer is compared to a predefined set of answers. A decision block represents a question beginning with **IF**. . . .

Authors will find flowcharting very useful for checking their logic. Flowcharts very quickly allow one to determine if a closed path exists within a frame or if an alternative leads a student to a point of no return. Further, flowcharts will make the job of writing in TACL a much easier task.

Overview of IBM 1500 Instructional System

The IBM 1500 Instructional System (hereafter referred to as the system) is well suited for interactive individual instruction. TACL is designed to utilize many of the capabilities of the system.

The course author only needs to familiarize himself with the components associated with the student station as seen in Figure 1.2.

Information Presentation. There are three methods of presenting instructional material through the student station. The *cathode ray tube* (CRT) is the device most often used for presenting information to the student. The CRT is similiar in appearance to a small television screen on which appear lines of text and specially designed line drawings. The screen, consisting of sixteen horizontal lines and forty horizontal columns, can display up to 640 characters.

The *image projector* is used for showing photographic images contained on a 16 mm film. The images may be either black and white or color and of much greater detail than the line drawings presented via the CRT. Each photographic image contains a unique number which can be referred to in the TACL program.

The *audio unit* is used to play audio messages contained on a magnetic tape. Each audio message is given a unique number which can be referred to in the TACL program.

Response Devices. A *light pen* device is attached to the CRT and enables the learner to respond to letters, figures and graphics, which appear on the CRT, by touching an appropriate area of the screen.

Also attached to the CRT is a typewriter-like *keyboard.* The student responds by typing an answer which is then matched with a list of answers supplied by the author.

Coding Sheets

Three different coding sheets are necessary for writing instructional material using TACL. A separate coding sheet is available for each of the three methods of information presentation: CRT, image projector, and audio unit.

CRT authoring sheets. Special coding sheets have been designed to aid the author in arranging text to appear on the CRT (Figure 1.3). In addition to formatting the text, the authoring sheets are also used to describe the flow of the course.

The center grid of the authoring sheet represents the display area of the CRT. Each character requires two rows and one column of the grid. Therefore, 16 lines each consisting of 40 characters may be presented at any given time. The bottom line of the grid

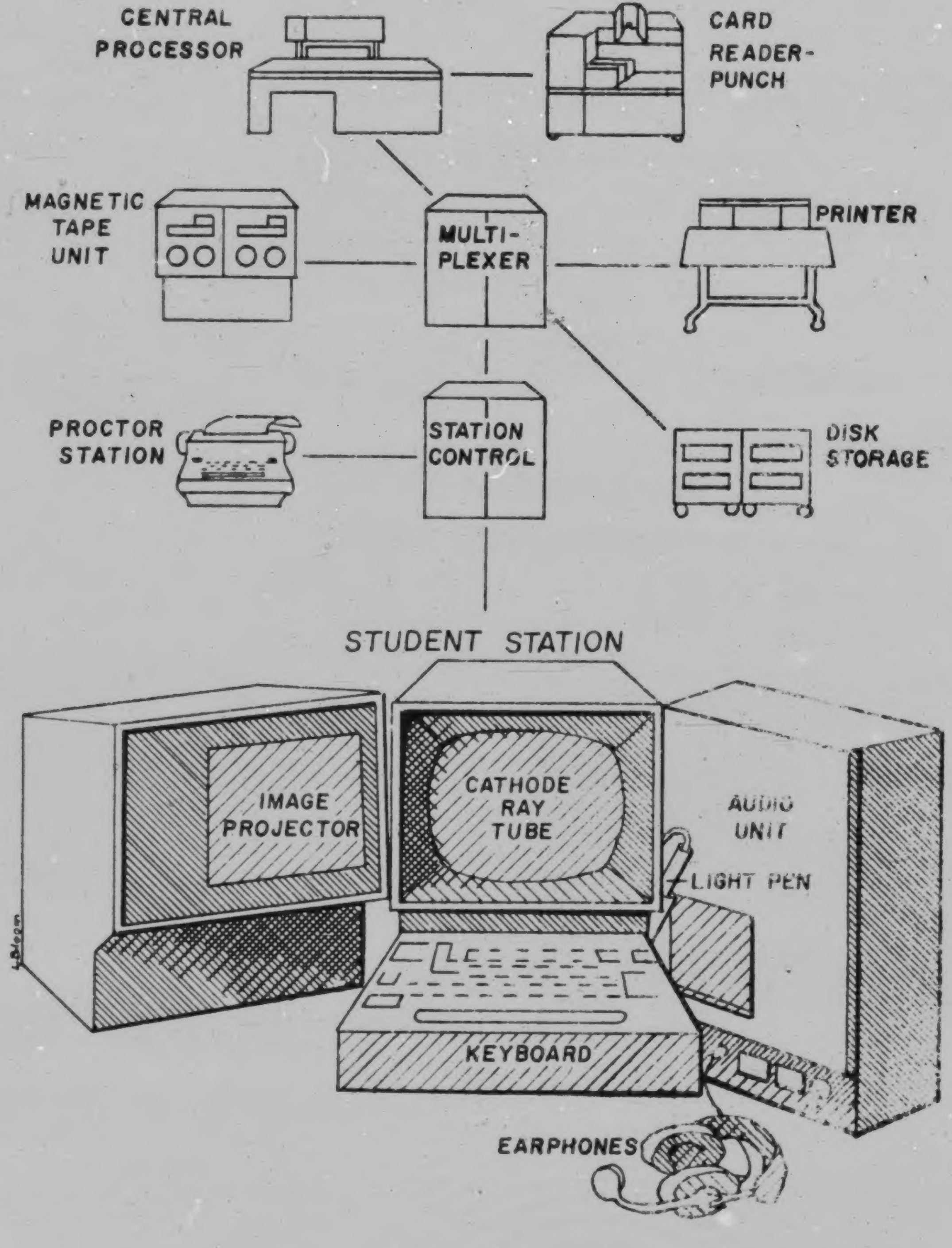


Figure 1.2. The IBM 1500 instructional system.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory

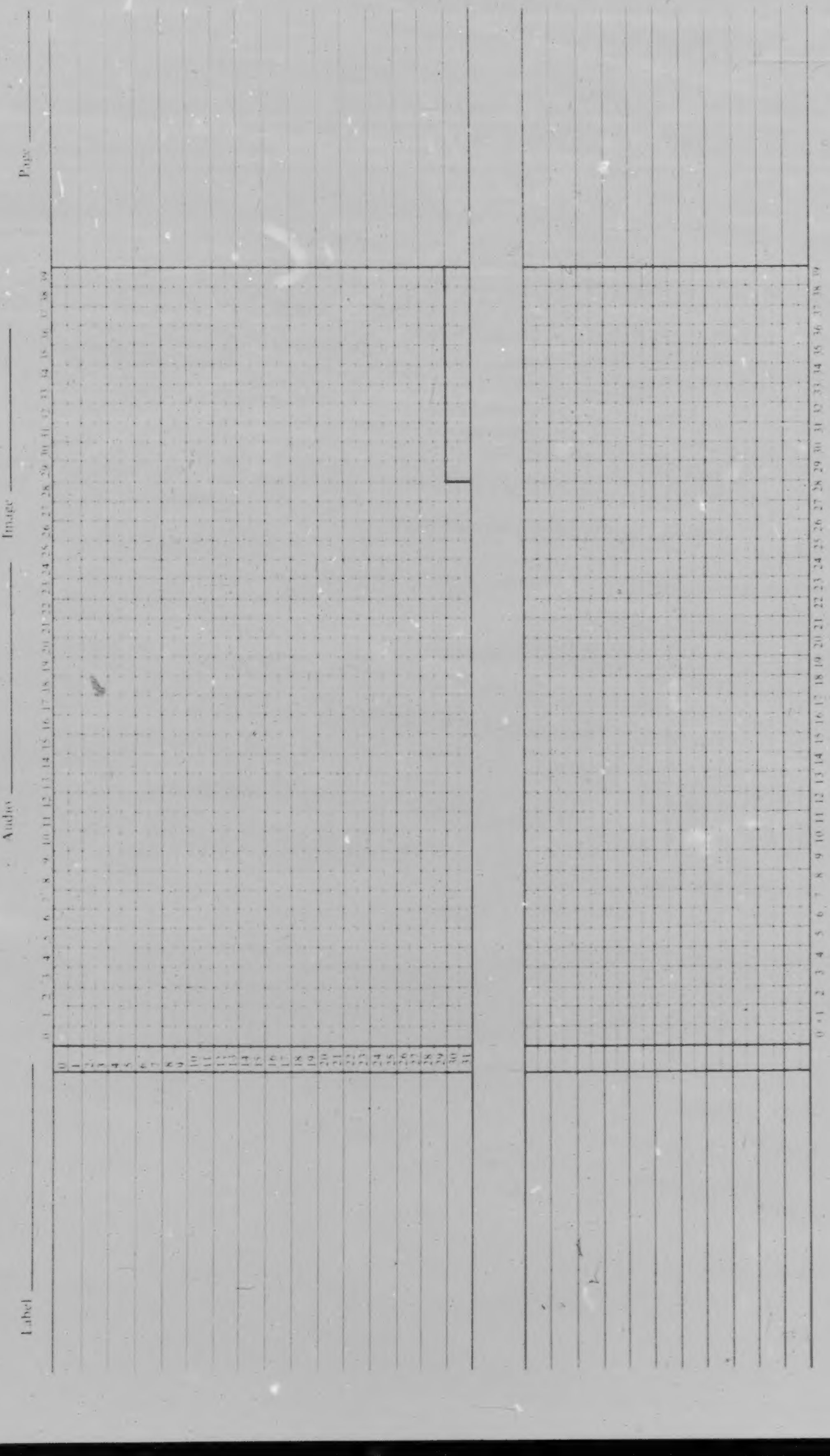


Figure 1.3 Sample TACL authoring sheet

(rows 30 and 31, columns 28 thru 39) should not be used as they are reserved for the frame label and special instructions which signal the student to make a light pen or keyboard response. The lower portion of the authoring sheet is used for feedback or additional TACL statements.

All instructions for the display should be written on the authoring sheet, i.e., text, anticipated answers, instructions for showing images, and instructions for playing audio messages. TACL instructions should be written to the left of the grid. All other instructions, or special requests, should be written to the right of the grid.

The authoring sheets should be numbered sequentially by the author. Each successive number should correspond to a new frame. In most cases a frame requires more than one authoring sheet to describe a problem. When this occurs, the author should subhead continuing pages of the same problem with the letters "a" through "z". For example: the first page of the second frame would be numbered 2; the next page of the second frame would be 2a; the third page of the second frame, 2b, etc.

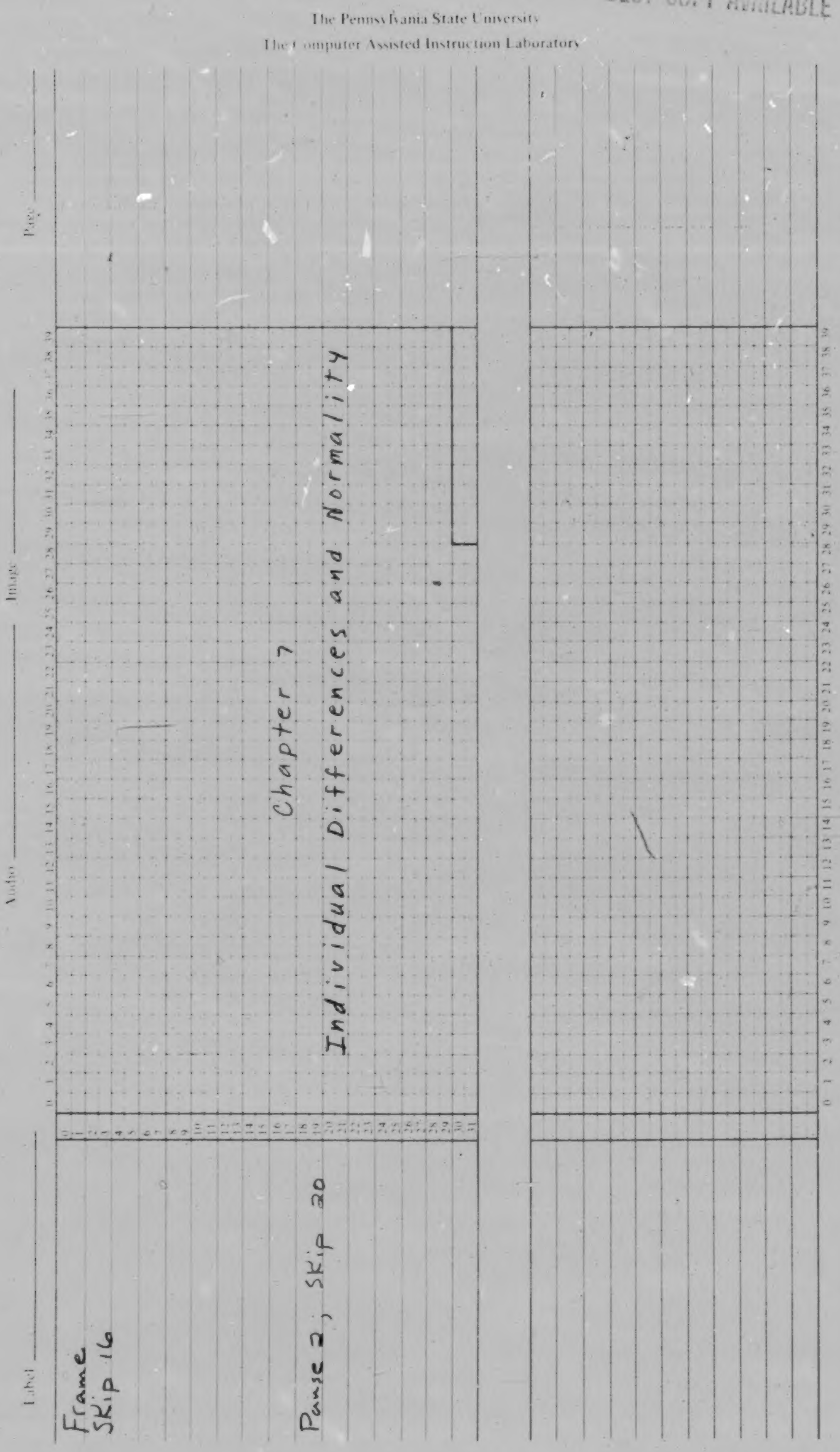
Example: Two sample frames are shown in Figures 1.4 and 1.5. Figure 1.6 shows a flowchart of the strategy used in Figures 1.4 and 1.5. Note that Figure1.4the title page, is numbered page 1; that the first frame is numbered page 2; and each character requires two rows and one column. It is not necessary that lines of text begin on an even or odd numbered row. The only requirement is that each character occupy two rows.

Image planning forms. All images should be described on the Image Planning Form (Figure 1.7) and should accompany the authoring sheets.

The image form should include: 1) the author's name, 2) course name, 3) date, and 4) unique image number assigned by the course coordinator. Requests may be for 35 mm slides which will be transferred to film at a later time. Particular attention must be paid to the horizontal format that is required of all images as well as to the legibility standards printed on the form.

Audio message program sheets. Audio messages should be written on the audio message program sheet (Figure 1.8)and should accompany the CRT authoring sheets. The audio sheet should include: 1) the course name, 2) the author's name, 3) the date, 4) the chapter identifier, 5) the message number which can not be repeated within the chapter, 6) the number of "emphasis" marks and 7) the message.

All activity at a terminal stops while an audio message is playing. However the audio message can be halted temporarily to allow some other activity to occur at the station. For example, one may want to show an image in the middle of audio message, or place some text on the CRT. An emphasis mark (two slashes) is used to indicate the point(s) at which the audio message should pause to allow the other activity to occur. Care should be taken to place emphasis marks at places where a pause would normally occur (e.g., at the end of a sentence) since there is a noticeable pause within the message.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label
Frame
Skip 16

Pause 2; Skip 20

Audio

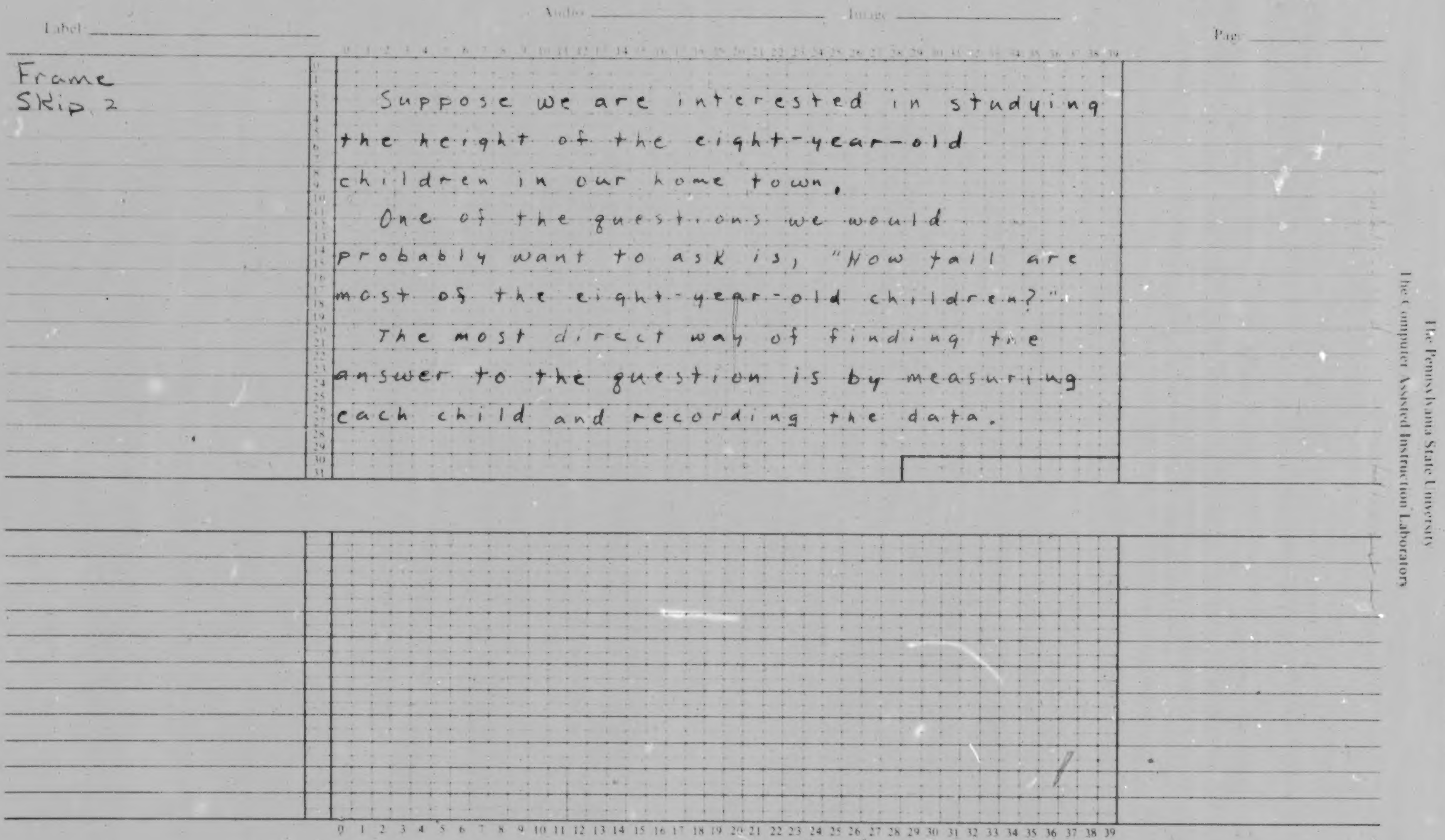
Image

Chapter 7

Individual Differences and Normality

Page

Figure 1.4. Pagination sample 1.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label: Frame Skip 2

Audio ______ Image ______ Page ______

Suppose we are interested in studying
the height of the eight-year-old
children in our home town.
One of the questions we would
probably want to ask is, "How tall are
most of the eight-year-old children?"
The most direct way of finding the
answer to the question is by measuring
each child and recording the data.

Figure 1.5. Pagination sample 2.

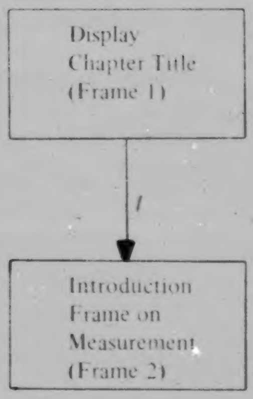


Figure 1.6. Flowchart of figures 1.4 and 1.5.

Coding Conventions

In order to maintain consistency between different course authors and between the text presented on the CRT, image projector, and/or audio unit, it is necessary to keep the following conventions in mind.

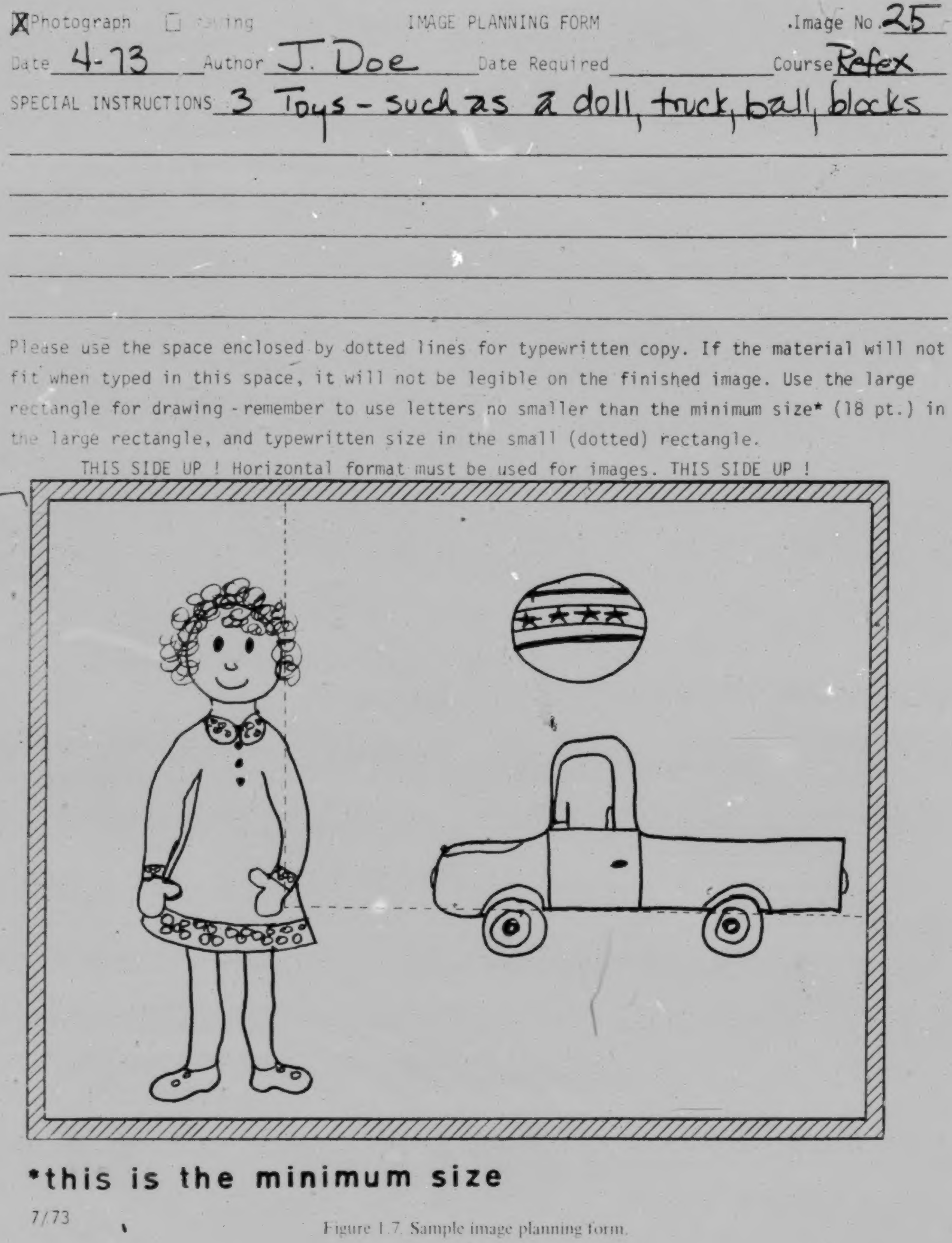
Vertical lists. A colon is commonly used to introduce a list. Except for complete sentences, the items should begin with lower case letters and there is no closing punctuation.

Example:

There are four types of reliability to be concerned about in this course.

They are as follows:

1. test-retest
2. equivalent forms
3. inter-scorer
4. intra-scorer



☒ Photograph ☐ Drawing IMAGE PLANNING FORM .Image No. 25

Date 4-73 Author J. Doe Date Required ________ Course Refex

SPECIAL INSTRUCTIONS 3 Toys - such as a doll, truck, ball, blocks

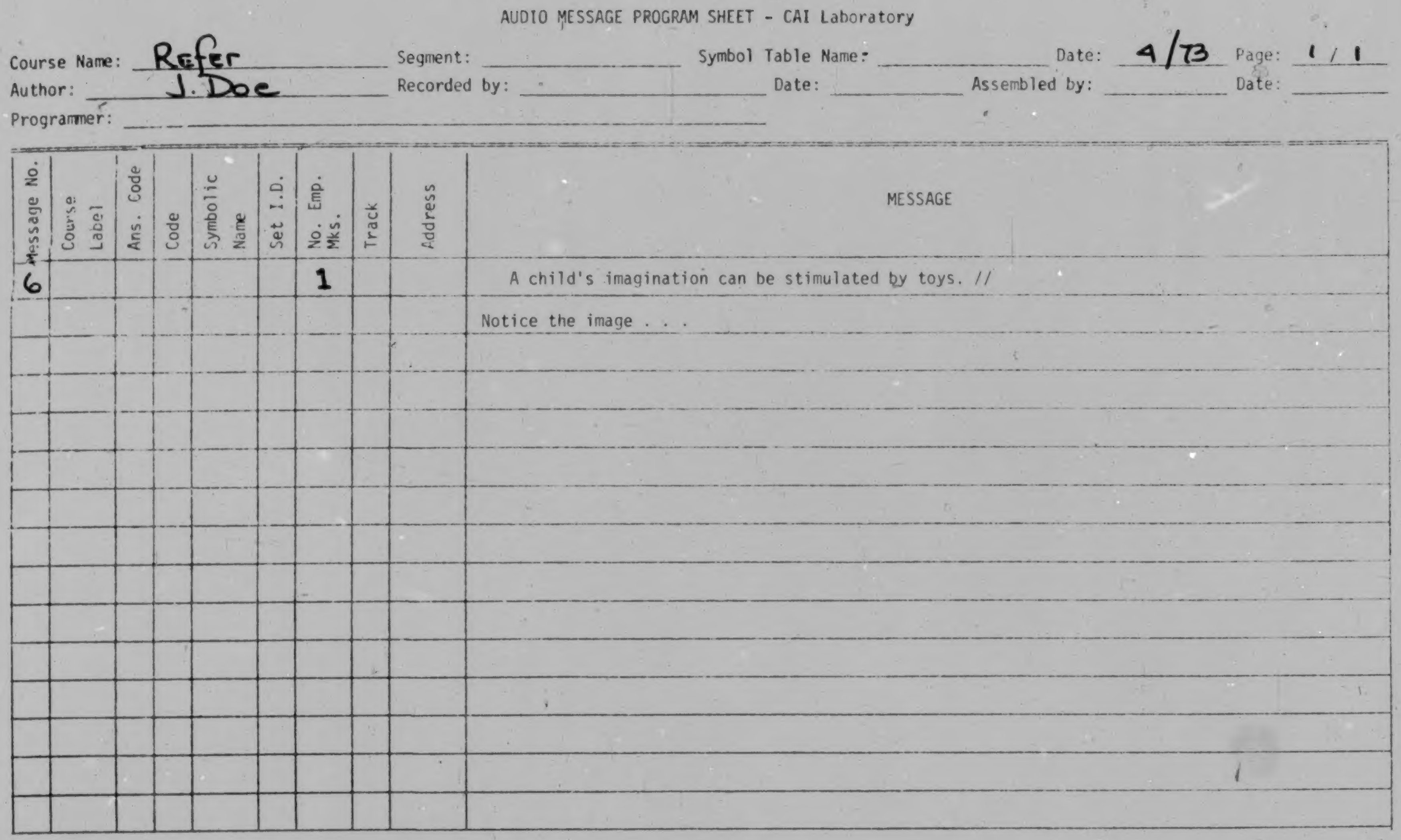
Please use the space enclosed by dotted lines for typewritten copy. If the material will not fit when typed in this space, it will not be legible on the finished image. Use the large rectangle for drawing - remember to use letters no smaller than the minimum size* (18 pt.) in the large rectangle, and typewritten size in the small (dotted) rectangle.

THIS SIDE UP ! Horizontal format must be used for images. THIS SIDE UP !

***this is the minimum size**

7/73

Figure 1.7 Sample image planning form.



AUDIO MESSAGE PROGRAM SHEET - CAI Laboratory

Course Name: Refer Segment: Symbol Table Name: Date: 4/73 Page: 1 / 1

Author: J. Doe Recorded by: Date: Assembled by: Date:

Programmer:

Message No.	Course Label	Ans. Code	Code	Symbolic Name	Set I.D.	No. Emp. Mks.	Track	Address	MESSAGE
6						1			A child's imagination can be stimulated by toys. //
									Notice the image . . .

Figure 1.8. Sample audio message program sheet.

Example:

There are two important generalizations which can be stated with considerable confidence. They are as follows:

1. In general, retarded children do not develop as fast as normal children.
2. Retarded children do not progress or develop to the same levels as normal children.

Punctuation. Commas and periods always lie inside the quotation marks; colons and semicolons always lie outside the quotation marks. Question marks and exclamation points vary with the construction of the sentence.

Paragraph indentation. At least three spaces should be used for paragraph indention. Within a frame, the number of spaces indented for paragraphs should be consistent.

Spacing after punctuation. One space should be left between the punctuation at the end of a sentence and the beginning of the next sentence.

Things to avoid.

1. Avoid hyphenation.
2. Avoid underlining groups of words. It is better to underline individual words.
3. Avoid skipping a varying number of rows between lines of text in a frame.
4. Avoid the use of: Instead use:

headphones	earphones
image projector, slide display	image
lightpen	light pen
spacebar	space bar

CHAPTER TWO

BASIC TACL INSTRUCTION FOR AUTHORS

Frame Identification

A frame is the smallest unit of the course. It is generally all the instructions involved in a single CRT display and any accompanying audio, images or feedback.

FORMAT: FRAME

This instruction (or one of its correlaries explained in Chapter 3) should be the first TACL instruction in each frame. The FRAME instruction produces the following results:

1. An [sp][1,2] appears in the lower right corner of the CRT screen;
2. A pause occurs until the student presses the space bar;
3. The CRT screen is erased after the student presses the space bar;
4. A new label (analogous to a page number) appears in the lower right-hand corner of the screen;
5. The text which follows this instruction will appear on the CRT just as it appears on the coding sheet.

FORMAT: FRAME*

A student may sign off at any point in a course. The position where the student will continue the course when he signs on again is controlled by the author and is known as a restart point. That is, when a person signs on to a course in which he had previously worked, he will resume executing the course at the last encountered restart point. Restart points prohibit the student from resuming his course in the middle of the development of a concept. An asterisk following the FRAME instruction defines that frame as a *restart point*. The other functions of the FRAME instruction are not changed.

---

[1] All of the letters included within a box are alternate coded characters. At Penn State an alternate coded character is defined as a black letter on a white background.

[2] The meaning of [sp] is defined in the first chapter of every course. [sp] is defined as meaning "Press the space bar to go on to the next frame." In this way the student has control over the amount of time he needs to study the frame.

Displaying Text

The large grid on the authoring sheets represents the display positions on the CRT. You will remember that each character of text requires two rows and one column of the grid on the authoring sheet, and that the text should be written on the authoring sheet at the same location it is expected to appear on the CRT. The text need not appear on adjacent rows; one, two, three, etc., rows may be left between lines of text depending on the quantity of text to be presented on the CRT. As the text appears on the CRT it will automatically erase any text which was previously located at that point on the CRT. Text not being replaced on the CRT will not be erased. The grid in the lower portion of the authoring sheet should be used to format additional information to be presented to the student (feedback). When placing text in the lower grid, the author may consider the feedback as replacing text previously located on the CRT. When using the lower grid to format text to be added to the original frame, care must be taken to insure that there is adequate room for the text on the screen.

Erasing the Screen

It is often necessary to erase all, or part of the CRT, as is most commonly done when one wishes to replace the text on a portion of the screen. The erase command is most frequently used when more than one message may appear on the CRT at various times.

FORMAT: ERASE

All of the text appearing on the CRT will be erased.

FORMAT: ERASE r_1 - r_2

All of the text from row$_1$, to and including row$_2$ will be erased.

Skipping to a Row

The skip instruction is used to indicate where the next row of text is to appear on the CRT. It is used:

1. If the next line of text is to be placed more than two lines below the last line of text;
2. If the next line of text will be located above the previous line of text;
3. If the text following the FRAME instruction does not begin on the top row (row 0) of the CRT.

The SKIP instruction can be used to skip up or down the screen.

FORMAT: SKIP r

The next line of text will begin at row r, where r is any row numbered from 0 to 30.

Pause

Many times it is desirable to halt execution of the computer program to make sure the student is following the text.

FORMAT: PAUSE

This instruction causes an [sp] to appear in the lower right corner of the CRT. The program will wait until the student presses the space bar. The PAUSE instruction is most often used to insure that the student has sufficient time to read and study the text before going on with additional information.

FORMAT: PAUSE n

The program will pause for n seconds. An [sp] does not appear on the CRT and the student does not press the space bar to continue. Caution must be used to insure that enough time is allowed for the student to complete the activity since the student does not control the length of the pause.

Example: See Figures 8, 9 and 10 (frames 1, 2, and 3 on pages 7 and 8 of *"Sample Computer Assisted Instruction Student Interactions"* by Hall, K. A. *et al*[3]).

Figure 2.4 contains a flowchart of the instructional strategy used in Figures 2.1, 2.2 and 2.3. The use of the FRAME, PAUSE and SKIP instruction are shown in Figures 2.1, 2.2 and 2.3. In Figure 8, the FRAME* instruction is used because the FRAME instruction represents a restart point. The SKIP 16 instruction preceeds the first line of text and indicates where the first line of text (Chapter 7) will appear.

After the first line of text appears, the program will wait 2 seconds before skipping to row 20 and displaying the second line of text (Individual Differences and Normality) on line 20.

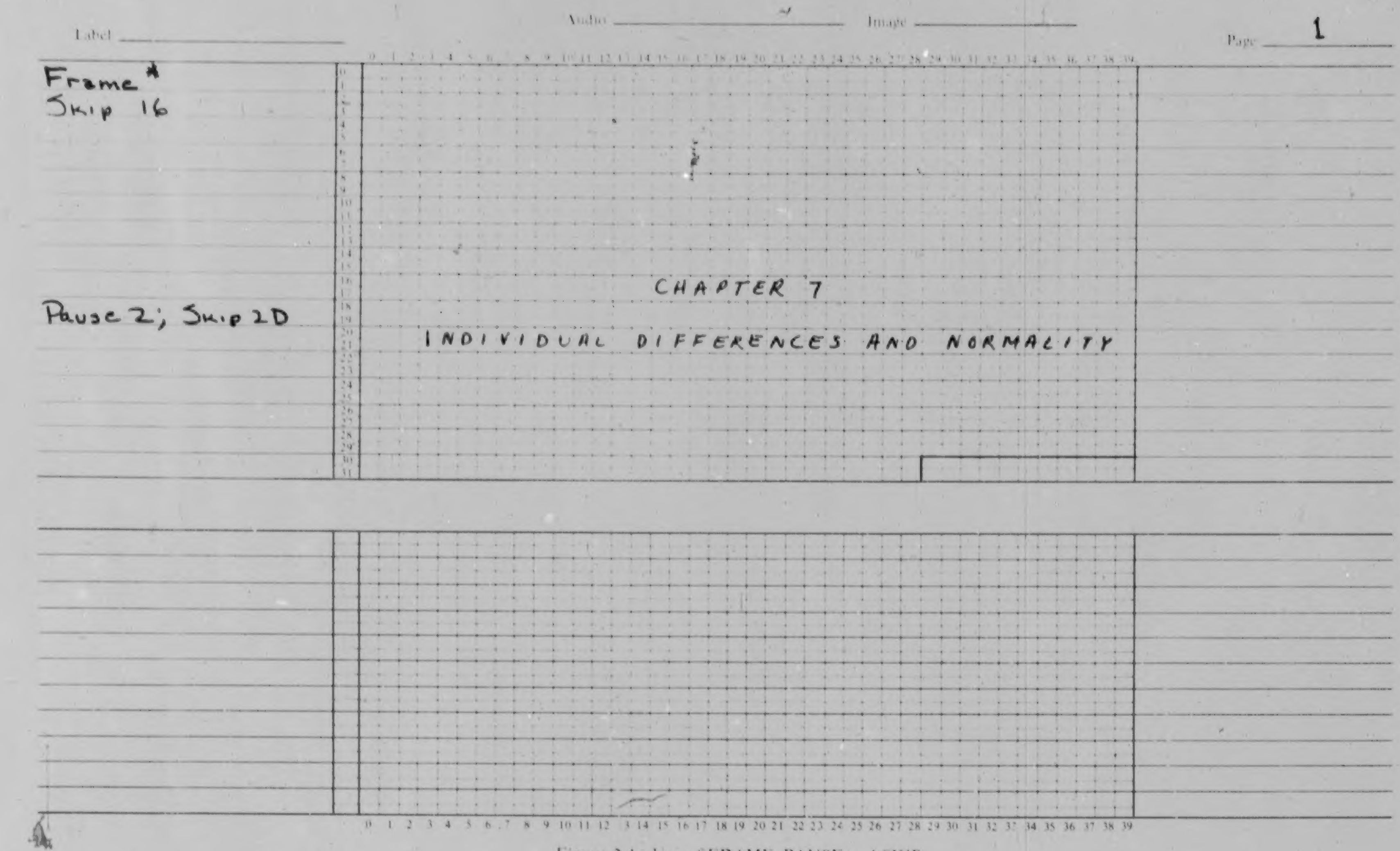
Figure 2.2 illustrates the second frame of the course as indicated by page 2. The FRAME instruction indicates the beginning of a new frame.

Figure 2.3 shows the coding for the third frame of the chapter. (The FRAME* instruction was not used because we would not want the student to begin at this point if he signed off. Remember: FRAME* should only be used when indicating development of a new concept.)

The program will wait until the student presses the space bar, thus indicating that his earphones are in place. The TACL statements following the PAUSE statement will be explained at a later time.

[3] *Sample, Computer Assisted Instruction Student Interactions* by Hall, K. A. will hereafter be referred to as **SCAISI**.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label
Audio
Image
Page 1

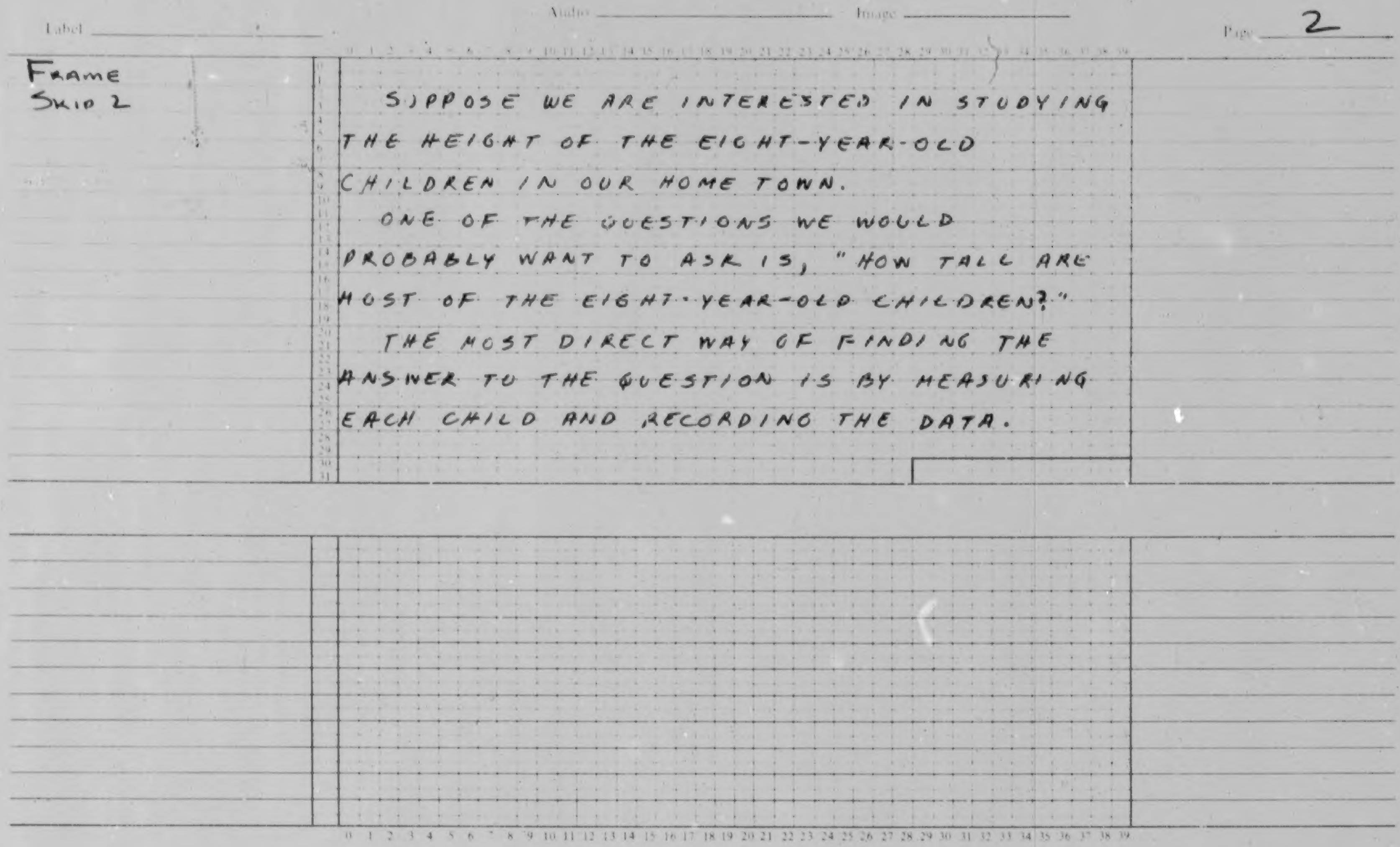
Frame*
Skip 16

Pause 2; Skip 2D

CHAPTER 7

INDIVIDUAL DIFFERENCES AND NORMALITY

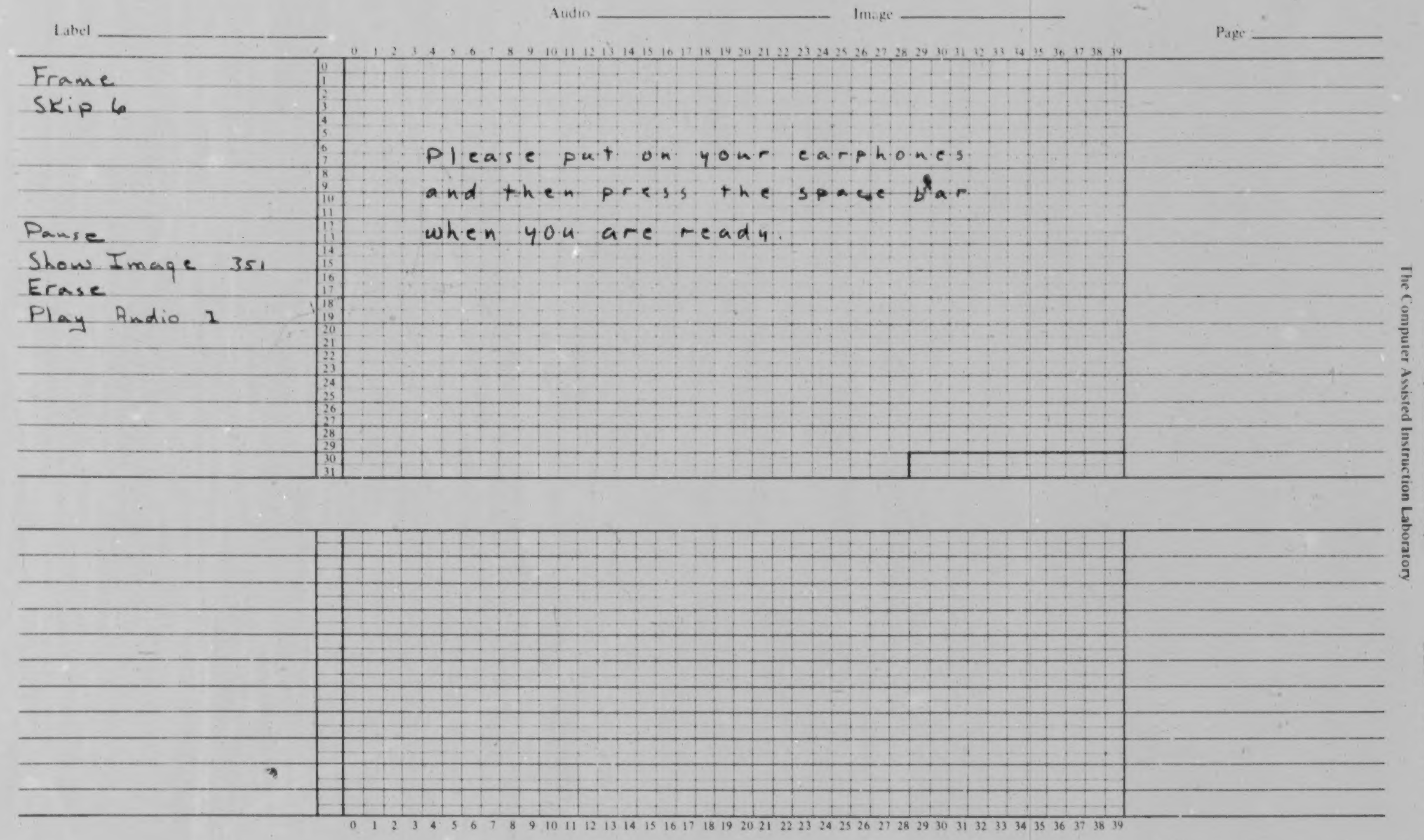
Figure 2.1. Use of FRAME, PAUSE and SKIP instruction, sample frame 1.



Label FRAME SKIP 2 Audio ______ Image ______ Page 2

SUPPOSE WE ARE INTERESTED IN STUDYING
THE HEIGHT OF THE EIGHT-YEAR-OLD
CHILDREN IN OUR HOME TOWN.
ONE OF THE QUESTIONS WE WOULD
PROBABLY WANT TO ASK IS, "HOW TALL ARE
MOST OF THE EIGHT-YEAR-OLD CHILDREN?"
THE MOST DIRECT WAY OF FINDING THE
ANSWER TO THE QUESTION IS BY MEASURING
EACH CHILD AND RECORDING THE DATA.

Figure 2.2. Sample frame 2.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Frame
Skip 6

Please put on your earphones
and then press the space bar
when you are ready.

Pause
Show Image 351
Erase
Play Audio 2

Figure 2.3. Sample frame 3.

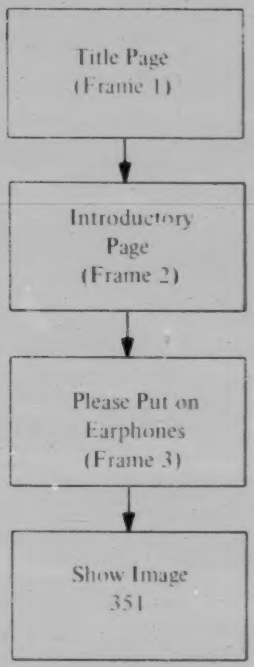


Figure 2.4. Flowchart of instructional strategy shown in figures 2.1, 2.2, and 2.3.

Control of Images

The images which are projected on the IBM 1512 image projector are contained on a 16 millimeter film cartridge. Each image is assigned a unique number from 1-999 by the course coordinator.

FORMAT: **SHOW IMAGE nnn**

Where nnn is a number from 1 to 999.

This instruction will cause image number nnn to be projected on the student's image projector.

FORMAT: **CLOSE IMAGE**

This instruction will cause the shutter on the image projector to close and the screen on the student's image projector will become black.

Control of Audio Messages

The message tapes, played on the IBM 1506 audio unit, are under program control. When they are played, all other processing stops for the duration of the message. A message may be stopped momentarily by using emphasis marks (//) on the audio request form. This pause is desirable when an author wishes to show an image on the image projector or put a display on the CRT screen.

FORMAT: **PLAY AUDIO nnn**

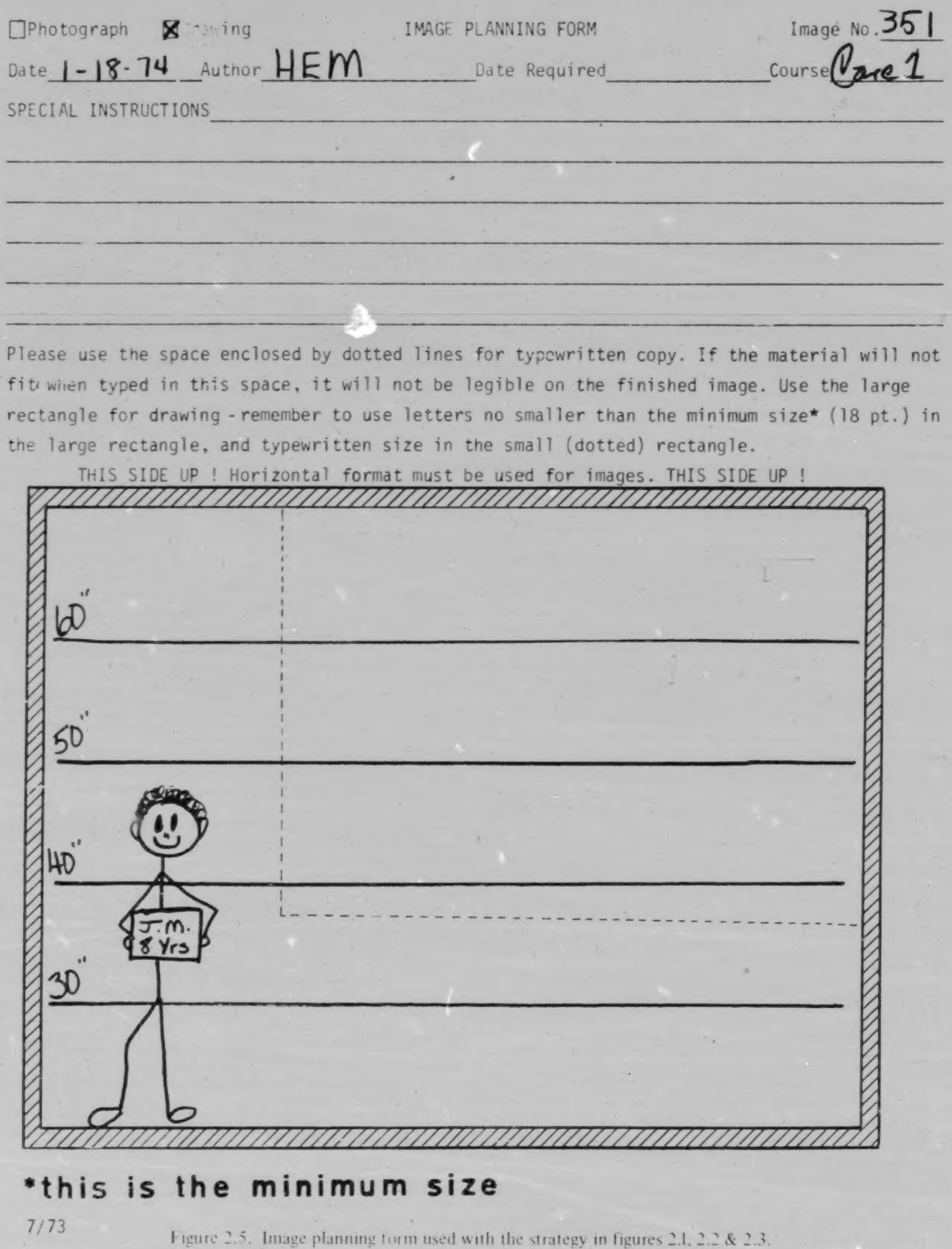
Where nnn is the range 1-999.

This instruction causes the message numbered nnn to play until the end of the message is reached or until an emphasis mark is encountered. An A will appear in the lower right corner of the CRT while an audio message is being played.

FORMAT: **RESUME AUDIO**

This instruction continues playing the current audio message which stopped when an emphasis mark was encountered. The audio message will continue playing until the end of the message is reached or until another emphasis mark is encountered.

Example. Refer to Figure 2.3. After the student presses the space bar indicating that his earphones are in place, image number 351 is shown to the student, then the CRT screen is erased (Figure 2.5 shows the image planning form for the image 351). Audio message 1 (shown in Figure 2.6) is then played for the student. Notice the position of the



☐ Photograph ☒ Drawing IMAGE PLANNING FORM Image No. 351

Date 1-18-74 Author HEM Date Required ______ Course Core 1

SPECIAL INSTRUCTIONS ______

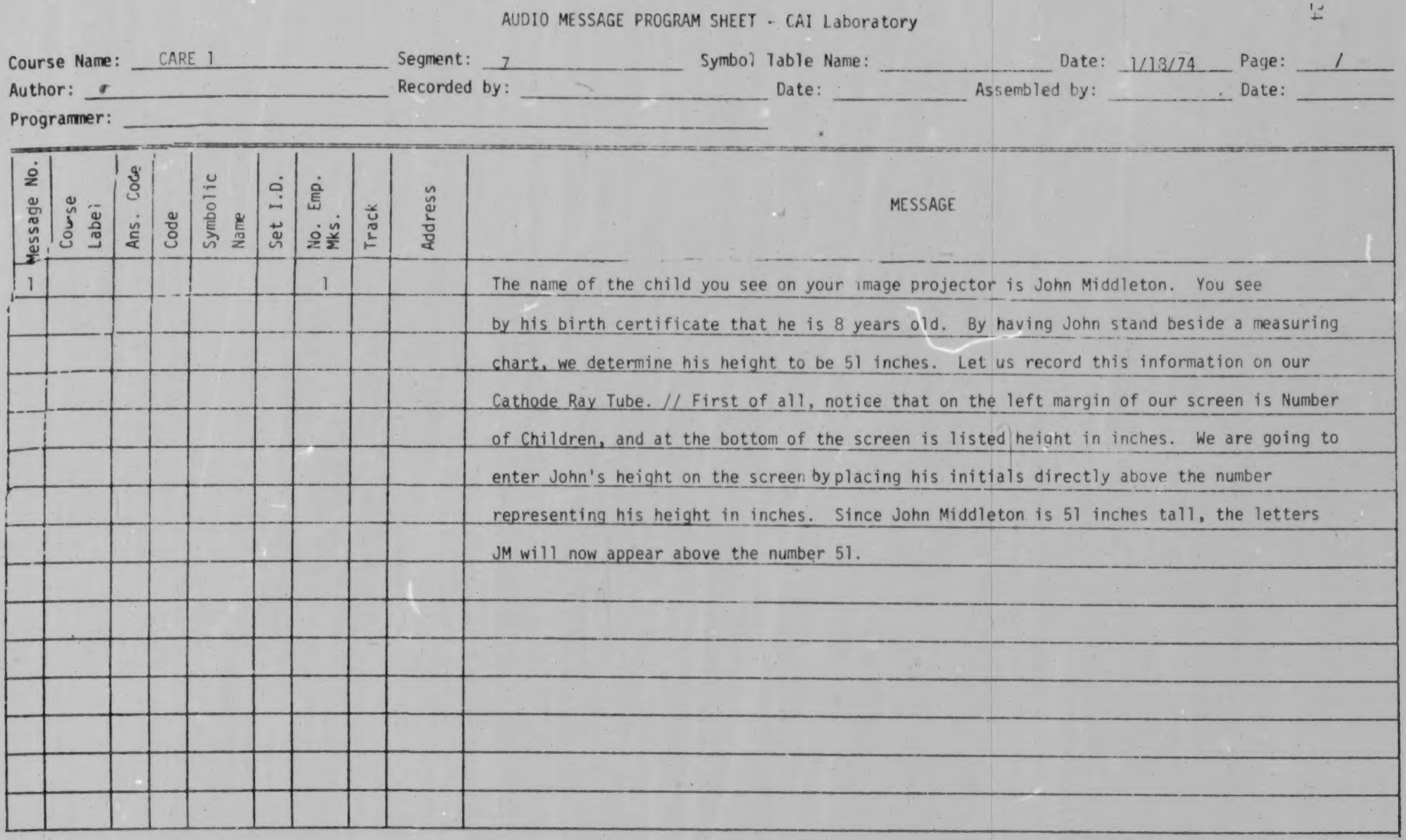
Please use the space enclosed by dotted lines for typewritten copy. If the material will not fit when typed in this space, it will not be legible on the finished image. Use the large rectangle for drawing - remember to use letters no smaller than the minimum size* (18 pt.) in the large rectangle, and typewritten size in the small (dotted) rectangle.

THIS SIDE UP ! Horizontal format must be used for images. THIS SIDE UP !

***this is the minimum size**

7/73

Figure 2.5. Image planning form used with the strategy in figures 2.1, 2.2 & 2.3.



AUDIO MESSAGE PROGRAM SHEET - CAI Laboratory

Course Name: CARE 1 Segment: 7 Symbol Table Name: Date: 1/13/74 Page: 1
Author: Recorded by: Date: Assembled by: Date:
Programmer:

Message No.	Course Label	Ans. Code	Code	Symbolic Name	Set I.D.	No. Emp. Mks.	Track	Address	MESSAGE
1						1			The name of the child you see on your image projector is John Middleton. You see by his birth certificate that he is 8 years old. By having John stand beside a measuring chart, we determine his height to be 51 inches. Let us record this information on our Cathode Ray Tube. // First of all, notice that on the left margin of our screen is Number of Children, and at the bottom of the screen is listed height in inches. We are going to enter John's height on the screen by placing his initials directly above the number representing his height in inches. Since John Middleton is 51 inches tall, the letters JM will now appear above the number 51.

Figure 2.6. Audio presented to student with image in figure 2.5 & the strategy in figures 2.1, 2.2 & 2.3.

emphasis mark on Figure 2.6. The emphasis mark is at the end of the sentence "Let us record this information on our cathode ray tube." At the conclusion of the sentence, the audio message will pause and the TACL statements shown in Figure 2.7 will be executed. Note that Figure 2.7 is not the beginning of a new frame, but rather the continuation of Frame 3. This is denoted by Page number 3A. If Page 4 were at the top of the coding sheet, then we would know that this was a new frame.

When the audio message pauses at the end of "cathode ray tube," the text shown in Figure 2.7 will be displayed. The text shown in Figure 13 is a chart. After the text is displayed on the CRT, the RESUME AUDIO instruction will cause audio message 1 to continue. At the end of audio message 1, the SKIP instruction will be executed and the line of text shown in the lower portion of the coding sheet will be displayed on row 24 of the CRT and the initials JM will appear above the number [52]. After the text is displayed, audio message 2 will be played to the student.

Requesting a Light Pen Response

Light pen responses are appropriate when the answer to a question already appears on the screen of the CRT and the student is to touch the correct answer with his light pen. The light pen is a light-sensing device; therefore, it is necessary that the student be given an alternate coded (black character on a white background) response area to touch. *All alternate-coded text will be considered as response areas. Only alternate-coded text will be considered as response areas.* After all of the text has been placed on the screen of the CRT, a "P" will appear in the lower right corner of the screen and the student will be able to press his light pen against the face of the CRT, at one of the alternate coded response areas.

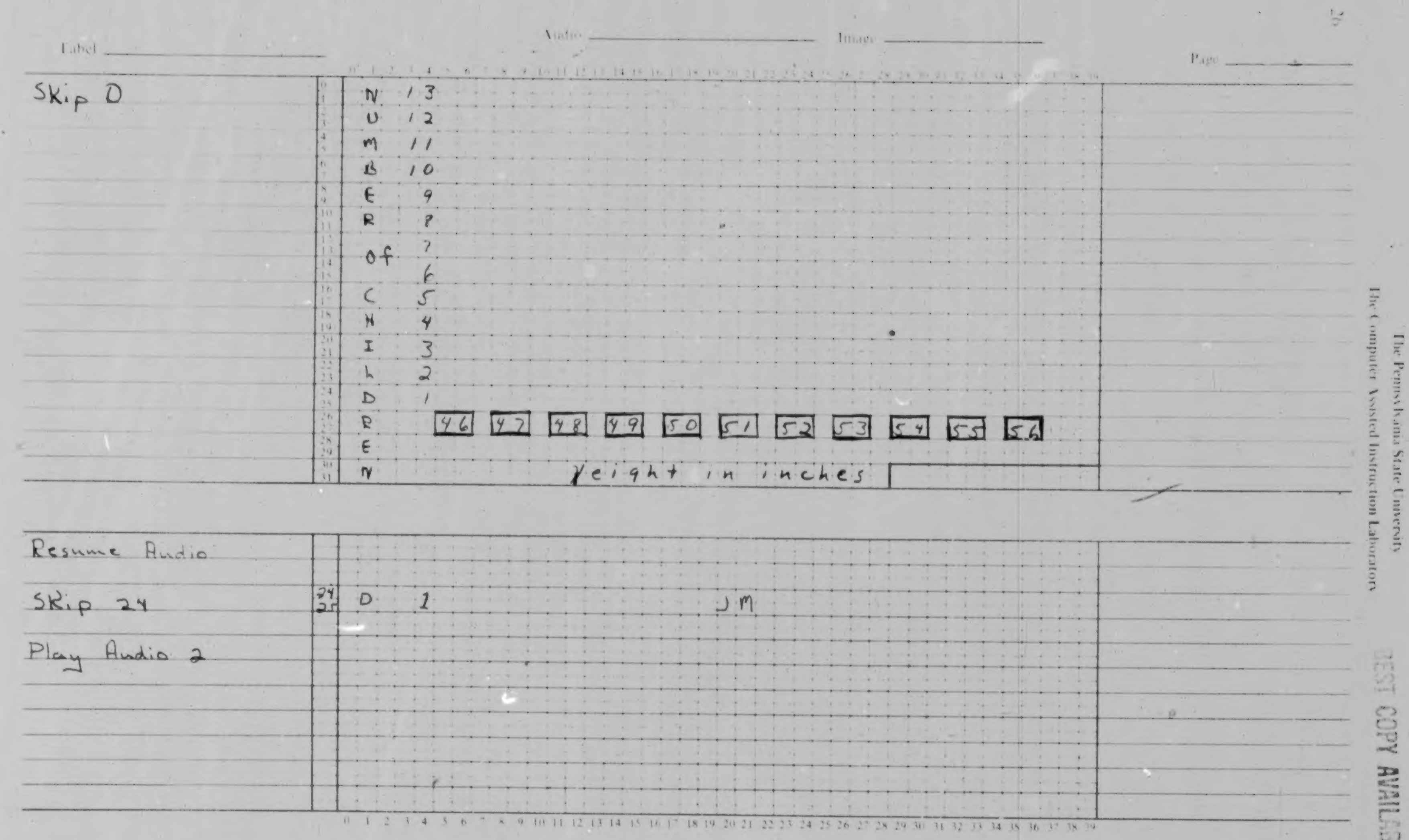
FORMAT: LIGHT PEN

The LIGHT PEN instruction should precede ~~the text of the frame~~ in which a light pen response is expected.

Example. See Figure 2.8 (SCAISI pg. 25 frame 54). Four response alternatives are provided for the student. The student is expected to press his light pen against either the [A], [B], [C] or [D]. Even if the student should press his light pen against some other position of the screen and the computer accepts his response, the response will not be properly evaluated.

When using light pen responses, it is not necessary to present an alternate coded character (a black character on a white background) to the student. Instead a solid white block may be used. The TACL programmer can accomplish this by special coding techniques [see Chapter III (Advanced TACL Instruction)]. If the author wishes to use solid blocks, he should still indicate the various alternatives as [A], [B], [C] etc. and make a note on the right hand side of the coding sheet to the programmer to use solid white blocks.

A note should also be written for the programmer indicating which of the various student responses is to be considered the correct response(s).



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Skip D

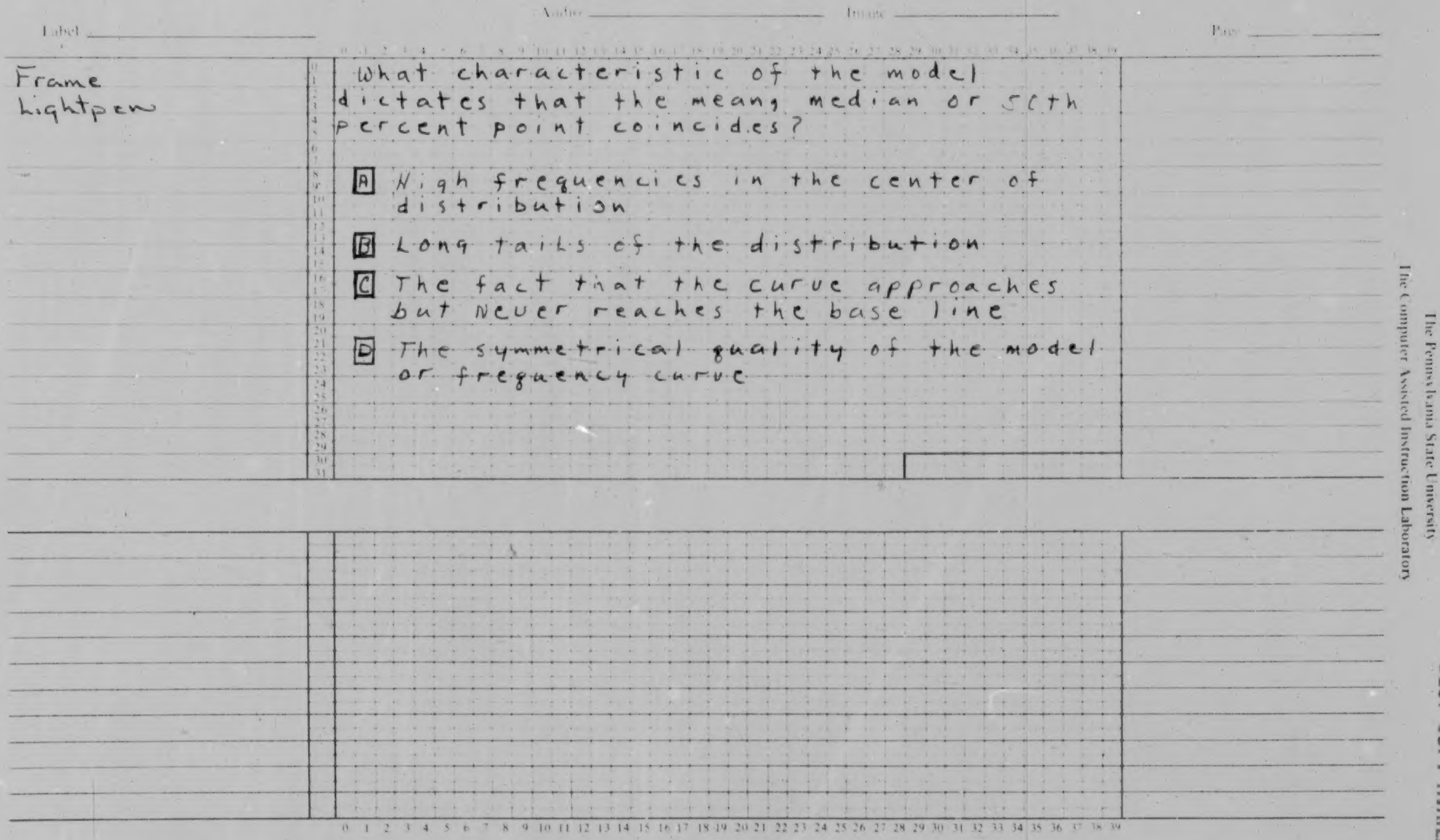
N 13
U 12
M 11
B 10
E 9
R 8
of 7
6
C 5
H 4
I 3
L 2
D 1
R 46 47 48 49 50 51 52 53 54 55 56
E
N Height in inches

Resume Audio

Skip 24 — 24 25 D 1 JM

Play Audio 2

Figure 2.7. Sample audio instruction.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ________ Audio ________ Image ________ Page ________

Frame
Lightpen

What characteristic of the model dictates that the mean, median or 50th percent point coincides?

A High frequencies in the center of distribution

B Long tails of the distribution

C The fact that the curve approaches but never reaches the base line

D The symmetrical quality of the model or frequency curve

Figure 2.8. Sample of lightpen instruction.

Requesting a Keyboard Response

Keyboard responses are appropriate when the student is required to construct an answer to a question and type his answer on the keyboard rather than use his light pen to point to an answer which already appears on the CRT.

FORMAT: KEYBOARD

The KEYBOARD instruction should precede the text of the frame in which a keyboard response is expected. After all of the text has been placed on the CRT screen, a "K" will appear in the lower right hand corner of the screen and the computer will recognize the student's typed response. If the KEYBOARD instruction is not used, the "K" will not appear on the CRT, and the student may still be able to press keys on the keyboard, but the computer will not recognize the response. *All characters typed on the keyboard when the "K" is not visible will be ignored by the computer.*

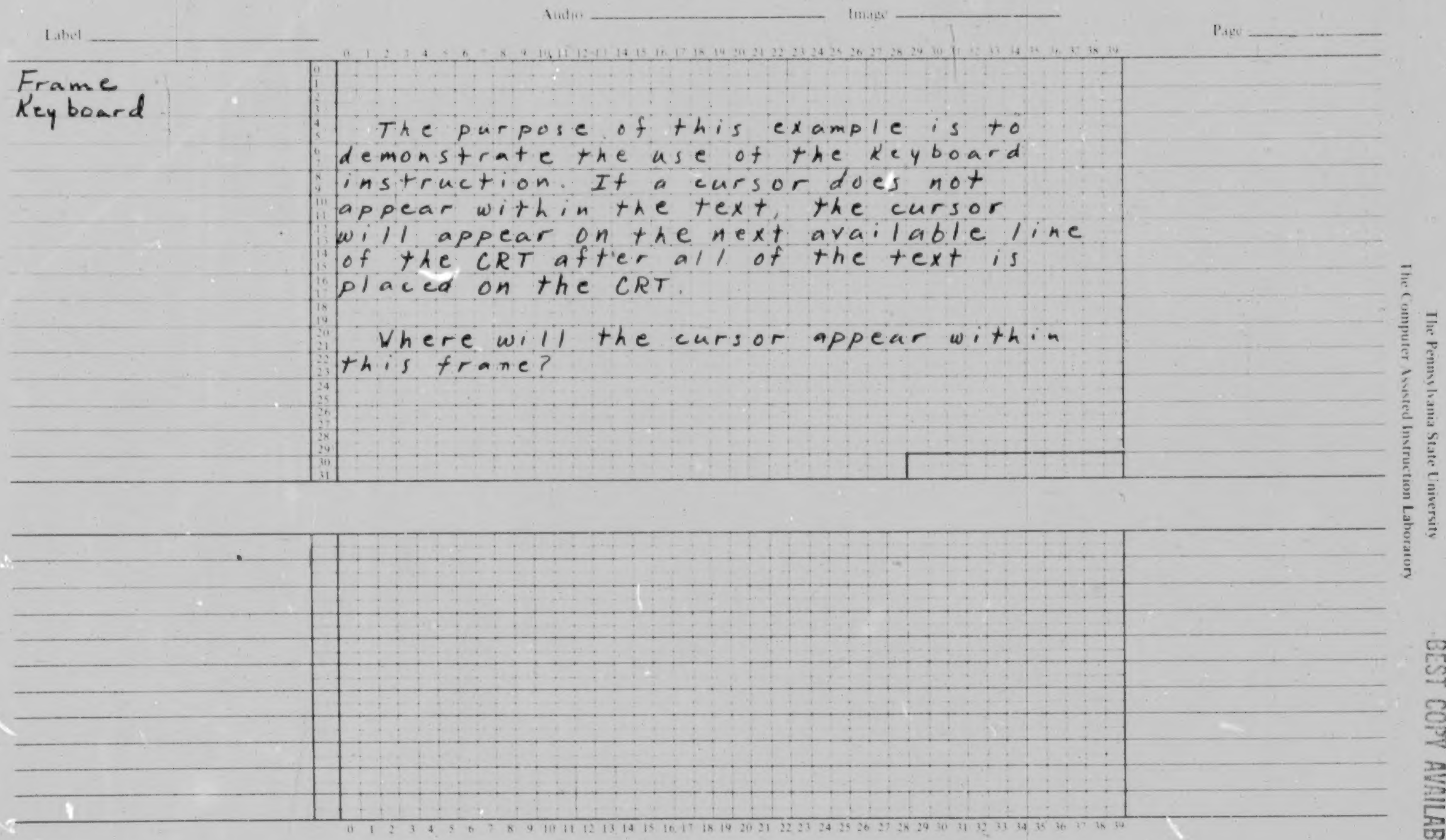
A cursor, a single column box, will also appear on the CRT when the "K" appears. The cursor indicates where the student's response will appear as he types it. If the author does not include a cursor within the CRT text itself, the cursor will automatically be placed on the next available line following the last line of text. When the cursor is placed on the next available line, the student will be able to type up to 40 characters.

Example. In Figure 2.9, the [ ] (cursor) will appear in column 0 of rows 24 and 25 after all of the text is placed on the screen of the CRT. At the same time, a "K" will appear in the lower right corner of the screen signifying that the student is to make a keyboard response. The student will be able to type a response consisting of up to 40 characters. Note: If the KEYBOARD instruction were not used, an [SP] would appear in the lower right hand corner of the screen, and even though the student could press the character keys on the keyboard, his response would not appear on the CRT and the computer would not recognize the response.

The author may also indicate where he would like the cursor to appear by drawing a cursor on the CRT. He may allow a 40 character response by placing the cursor in column zero, or he may limit the number of available characters by placing the cursor on a line with other text. When the author uses a cursor within the CRT text, he must allow at least one blank space before and after the response area.

Example. See Figure 2.10 (SCAISI pg. 22 frame 44). Note that the cursor appears in column 11 of rows 18 and 19. After the text appears on the CRT, the cursor will appear in column 11 of rows 18 and 19 and the student's answer will appear at that location as he types it. The student will have only 29 spaces for his answer compared to 40 spaces if the cursor were placed in column 0.

Example. See Figure 2.11 (SCAISI pg 29 frame 63). Notice that the cursor in column 29 of rows 6 and 7 is surrounded by text. After the text appears on the CRT screen, the "K" will appear in the lower right corner of the screen and the student's answer will appear in rows 6 and 7 beginning in column 29. If the student's answer reaches column 32, the K will disappear and the computer will not recognize any additional characters of the student's response.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label: Frame Keyboard

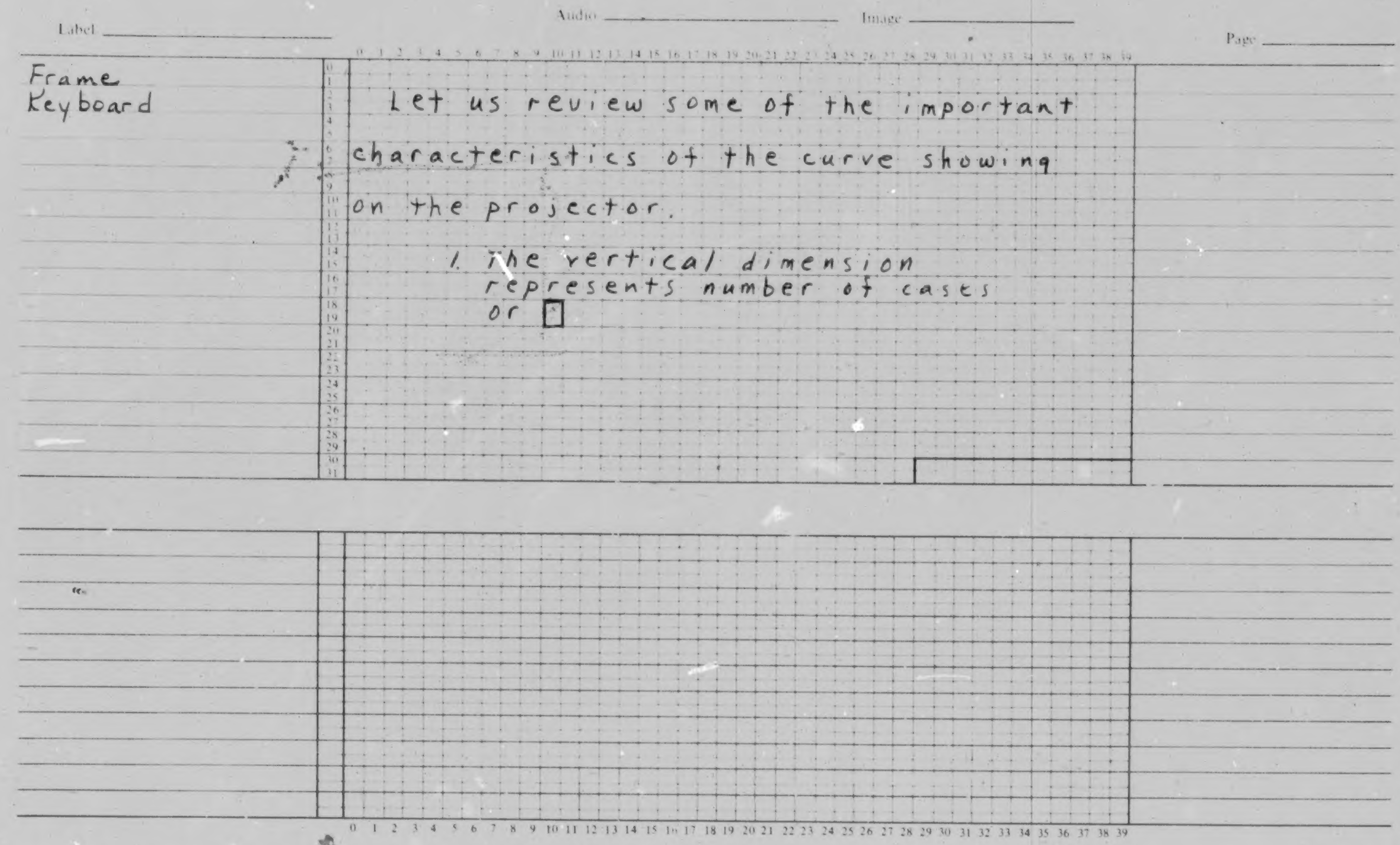
Audio ______ Image ______ Page ______

The purpose of this example is to demonstrate the use of the keyboard instruction. If a cursor does not appear within the text, the cursor will appear on the next available line of the CRT after all of the text is placed on the CRT.

Where will the cursor appear within this frame?

Figure 2.9. Sample of keyboard instruction.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label

Audio

Image

Page

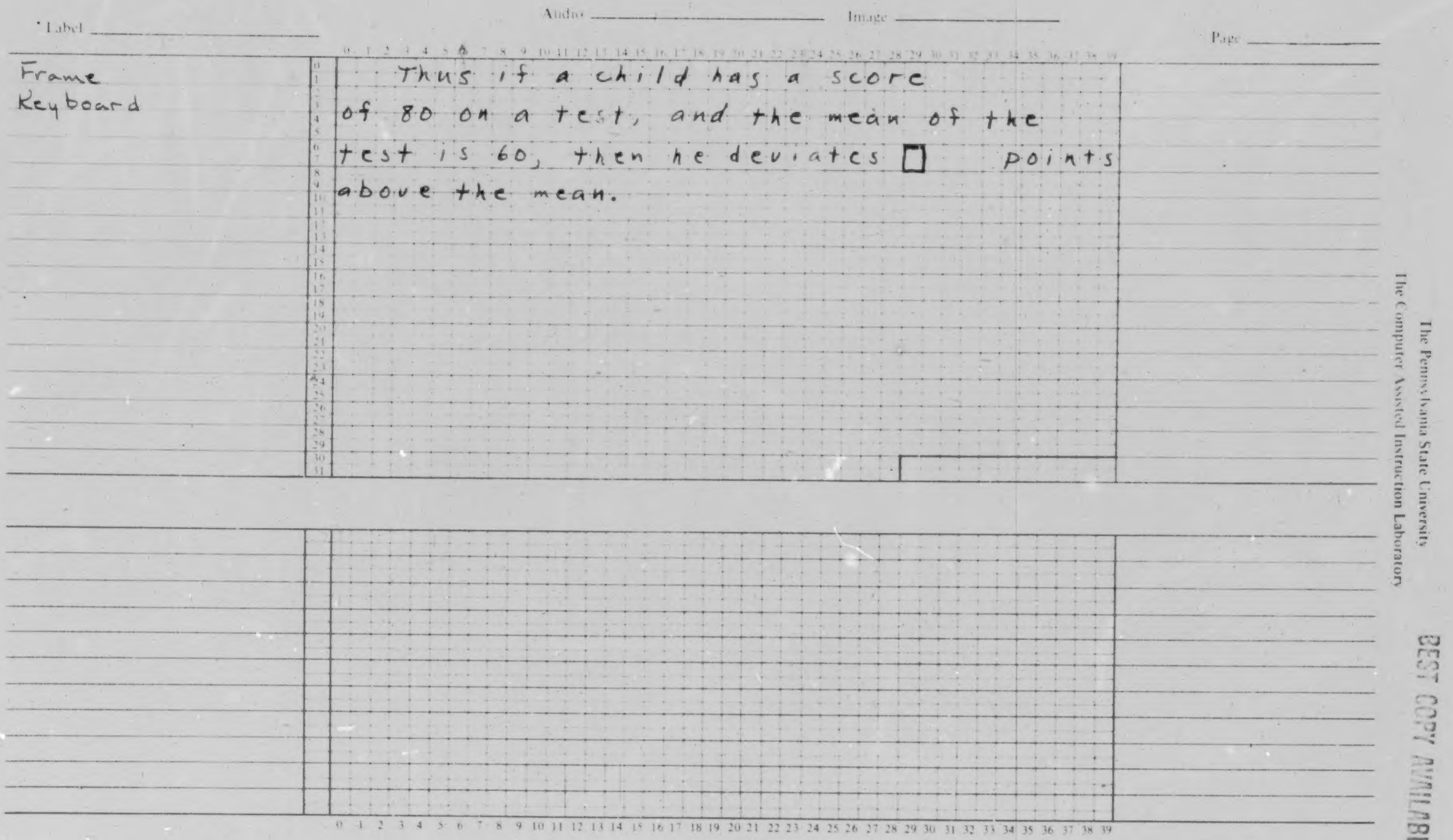
Frame
Keyboard

Let us review some of the important
characteristics of the curve showing
on the projector.

1. The vertical dimension
represents number of cases
or ☐

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

Figure 2.10. Sample of keyboard insert (1).



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Frame
Keyboard

Thus if a child has a score
of 80 on a test, and the mean of the
test is 60, then he deviates ☐ points
above the mean.

Figure 2.11. Sample of keyboard insert (2).

Branching Overview

The power of the computer lies in its ability to rapidly perform calculations and comparisons. Whereas a textbook asks the student to evaluate his own response and modify his own path through the course material, the computer can be made to evaluate the responses and automatically modify the instructional material for each student. For example the computer can be programmed to skip the student past the next 10 frames of material if the student correctly answered 9 out of the last 10 questions. If the student correctly answered 60% of the questions the student could be given the option of skipping the next 5 frames of instructional material. Furthermore, if the student elects to skip the material the computer will automatically skip past the material. If the student does not elect to skip the material, he will proceed through the material.

The ability to skip course material is called *branching*. A branch statement alters the course flow. There are two types of branching: 1) unconditional branching where the course flow is changed regardless of current conditions; and 2) conditional branching where a branch occurs only when a specified condition is met.

Labels

Labels are reference points in a course. They provide a means of identifying locations within a course. Labels are most generally used in conjunction with branch statements since they can be used to identify a location to which to skip.

FORMAT: LABEL: c

This form of the LABEL instruction is a single alphabetic character, unique within each frame, which may be referenced only within the frame in which it is defined. It is only used to identify portions of a frame. In order to identify a section not within a frame, the following format must be used.

FORMAT: LABEL: cccc

This form of the LABEL instruction is any two-to-four-character name beginning with an alphabetic character. The label must be unique to that chapter, however, it can be reused in a different chapter.

Unconditional Branches

An unconditional branch affects the course flow for all students executing the branch statement.

FORMAT: GO TO a

The a is a single alphabetic character which is defined by a LABEL: a statement within a same frame as the GO TO statement. The GO TO a instruction is used for branching within a frame.

FORMAT: GO TO aaaa

The aaaa is a two-to-four-character label which is or will be defined by the LABEL: aaaa instruction. The Label aaaa must be contained within the chapter.

FORMAT: GO TO NEXT

Next refers to the beginning of the next frame.

Conditional Branches: Light Penn Response Evaluation

The light pen is a light sensitive instrument which a student may use to point to an area of the CRT screen. Any area of the CRT screen which contains text is a possible response, however, only alternate coded areas (areas which contain black letters on a white background) are valid light pen response alternatives. To analyze a light pen response, the student's answer must be compared to each *anticipated response.*

FORMAT: IF ("ALT 1") GO TO aaaa

Where "ALT 1" is the anticipated light pen response which will be compared to the student's response. If the student's response exactly matches "ALT 1," the student will be branched to aaaa, where aaaa is:

1) A single alphabetic character which is defined by a LABEL instruction in the same frame as the IF instruction.
2) Any 2-4-character label beginning with a letter which was or will be defined in the same chapter with the LABEL instruction.
3) NEXT, which refers to the beginning of the *next frame.*

If the student's response does not match "ALT 1" the student will not be branched to aaaa. Instead, the program will examine the next TACL instruction. An IF ("ALT 1") GO TO aaaa instruction should be present for each anticipated response.

As indicated earlier, the student may point his lightpen to any area of the screen that contains text. Only alternate coded text is considered to be anticipated response areas. All other text on the screen is considered to be an *unanticipated response alternative.* A different TACL instruction is used to evaluate unanticipated light pen responses.

FORMAT: UN

The UN instruction should always follow a list of IF instructions. The UN instruction will be executed only if the student's response does not match one of the anticipated responses. Any TACL instructions which follow the UN statement will be executed after the UN is executed. Authors generally place hints at this location and ask the student to try again.

Any number of UN's may be placed in a row. The first time the student makes an unanticipated response, the program will execute the statements located under the first UN statement. If the student makes a second unanticipated response to the same question, the program will execute the statements located under the second UN statement, etc. The last UN will be repeated for each additional unanticipated response to that question. Therefore, the last UN should provide the student with: 1) sufficient information to allow him to answer the questions; 2) instructions to seek additional help; 3) remedial information.

After each UN is executed, a TACL instruction must be provided indicating the location where the student should be branched. A GO TO statement would serve this purpose, or one may use a REPEAT instruction.

FORMAT : REPEAT

The REPEAT instruction allows the student to respond to the last question - to *repeat* the last question. The REPEAT instruction is a branch to the last response request.

Example. (SCAISI, pg. 25, frame 53) Figures 2.12 and 2.13 show the use of the FRAME, LIGHTPEN, IF, UN, SKIP and REPEAT instructions. Figure 2.14 contains the flowchart of the instruction strategy. If the student points his lightpen to the white box with an A inside (alternate coded A, shown [A]) the student would be branched to label a and the text:

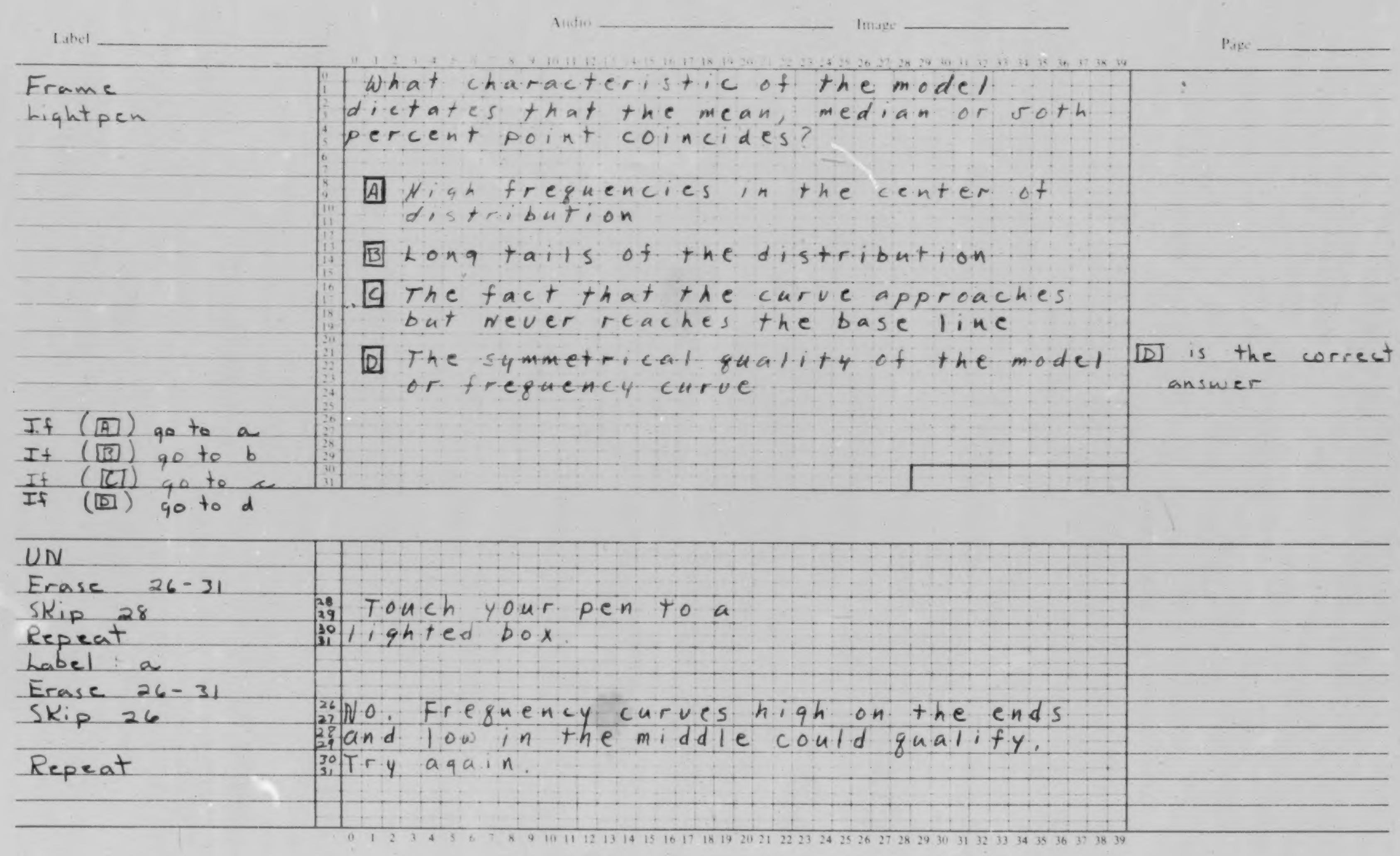
NO. FREQUENCY CURVES HIGH ON THE ENDS AND LOW
IN THE MIDDLE COULD QUALIFY. TRY AGAIN.

would be placed on the screen. The P will then reappear in the lower right hand corner of the CRT and the student will be able to choose a different answer with his light pen. If the student would again point to [A], he would receive the same feedback.

If the student were to point to [B], the text following label b would be placed on the screen. The student would then repeat the question and choose a different answer.

If the student were to point to [C], the text following label c would be placed on the screen and the student would repeat the question.

If the student were to point to [D], the text following label d would be placed on the screen after which the student would skip to the next frame.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ____ Audio ____ Image ____ Page ____

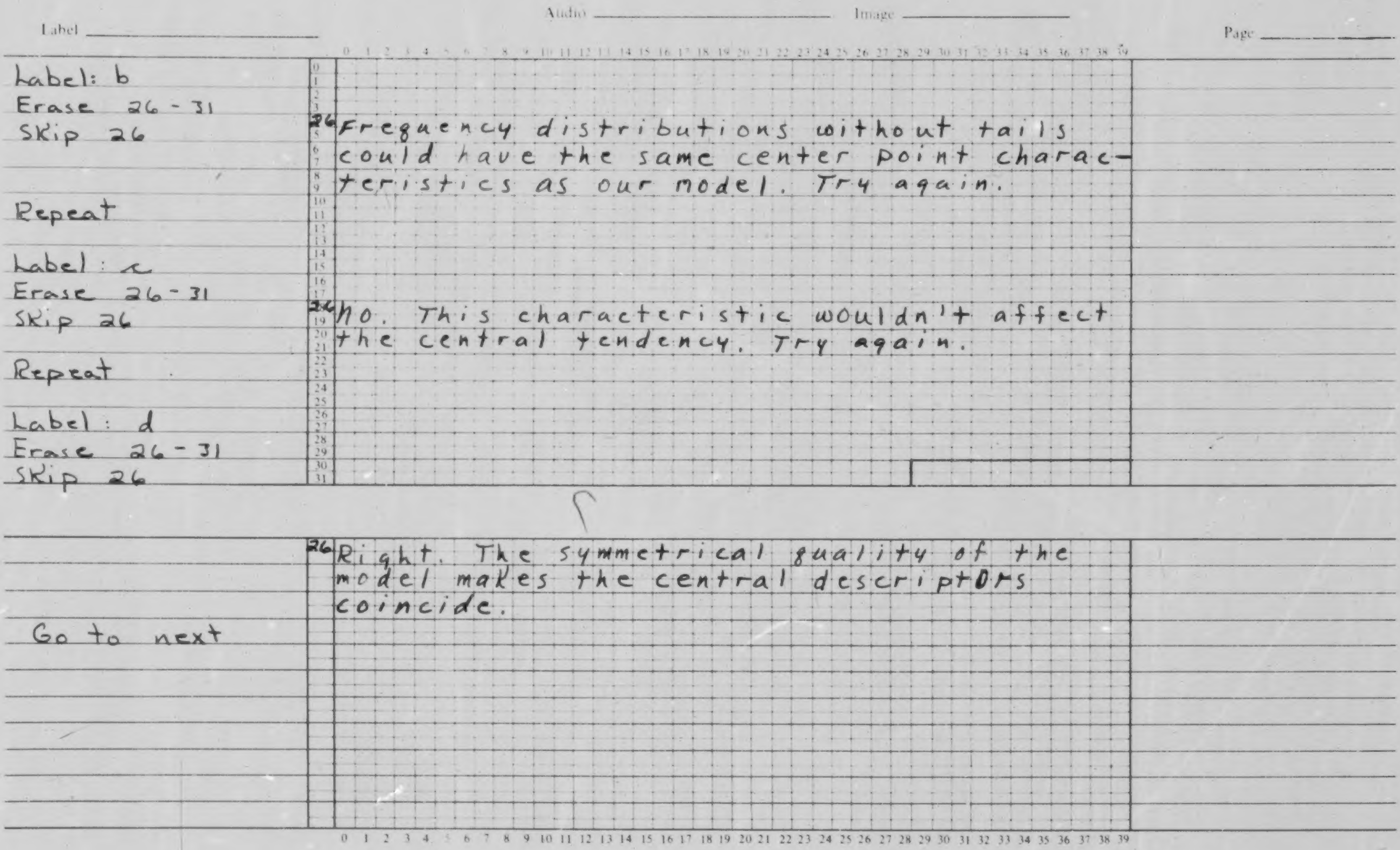
Frame Lightpen	What characteristic of the model dictates that the mean, median or 50th percent point coincides?	
	[A] High frequencies in the center of distribution	
	[B] Long tails of the distribution	
	[C] The fact that the curve approaches but never reaches the base line	
	[D] The symmetrical quality of the model or frequency curve	[D] is the correct answer

If ([A]) go to a
If ([B]) go to b
If ([C]) go to c
If ([D]) go to d		

UN		
Erase 26-31		
Skip 28	28 29 Touch your pen to a	
Repeat	30 31 lighted box.	
Label: a		
Erase 26-31		
Skip 26	26 27 NO. Frequency curves high on the ends	
	28 29 and low in the middle could qualify.	
Repeat	30 31 Try again.	

Figure 2.12. Sample of lightpen IF, and UN instruction

The Pennsylvania State University
The Computer Assisted Instruction Laboratory


Label ______ Audio ______ Image ______ Page ______

Label: b
Erase 26 - 31
Skip 26

26 Frequency distributions without tails could have the same center point characteristics as our model. Try again.

Repeat

Label: c
Erase 26 - 31
Skip 26

26 No. This characteristic wouldn't affect the central tendency. Try again.

Repeat

Label: d
Erase 26 - 31
Skip 26

26 Right. The symmetrical quality of the model makes the central descriptors coincide.

Go to next

Figure 2.13. Sample of LABEL, ERASE, REPEAT and GO TO instructions.

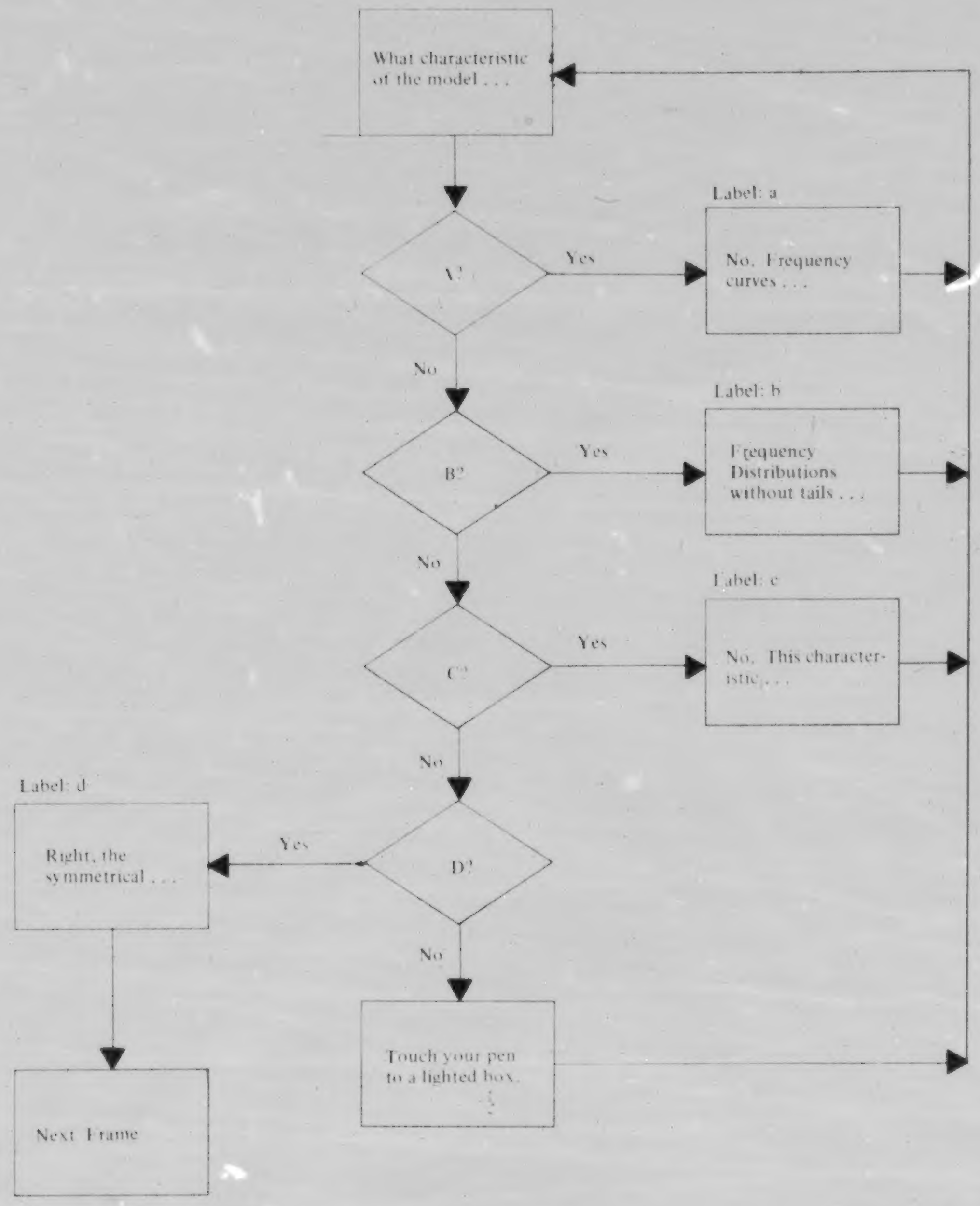

What characteristic of the model . . .
Label: a
A?
Yes
No. Frequency curves . . .
No
Label: b
B?
Yes
Frequency Distributions without tails . . .
No
Label: c
C?
Yes
No. This characteristic . . .
No
Label: d
D?
Yes
Right, the symmetrical . . .
No
Touch your pen to a lighted box.
Next Frame

Figure 2.14. Flowchart of instructional strategy shown in figures 2.12 and 2.13.

If the student pointed to a lighted area of the screen other than the [A], [B], [C], or [D], the text TOUCH YOUR PEN TO A LIGHTED BOX would be placed on the screen and the student would repeat the question. The same message TOUCH YOUR PEN TO A LIGHTED BOX will appear on the screen each time the student chooses other than a lighted box.

Conditional Branches: Keyboard Response Evaluation

There are two ways to evaluate keyboard responses. The first and simplest methods requires an exact match, which is useful when one is trying to train students to spell correctly or to develop a new vocabulary. However, students find this method of answer processing quite restrictive, since mispelled words and synomons are not evaluated as correct responses.

FORMAT: IF (---) GO TO aaaa

If the student types the word(s) which *exactly* match(es) the word(s) contained within the parenthesis, he will be branched to aaaa where aaaa is:

1. A single alphabetic charcter which is defined by a LABEL instruction in the same frame.
2. A two-to-four-character name beginning with an alphabetic character which has been, or will be defined by the LABEL instruction within the same chapter.
3. NEXT which refers to the *next* FRAME instruction.

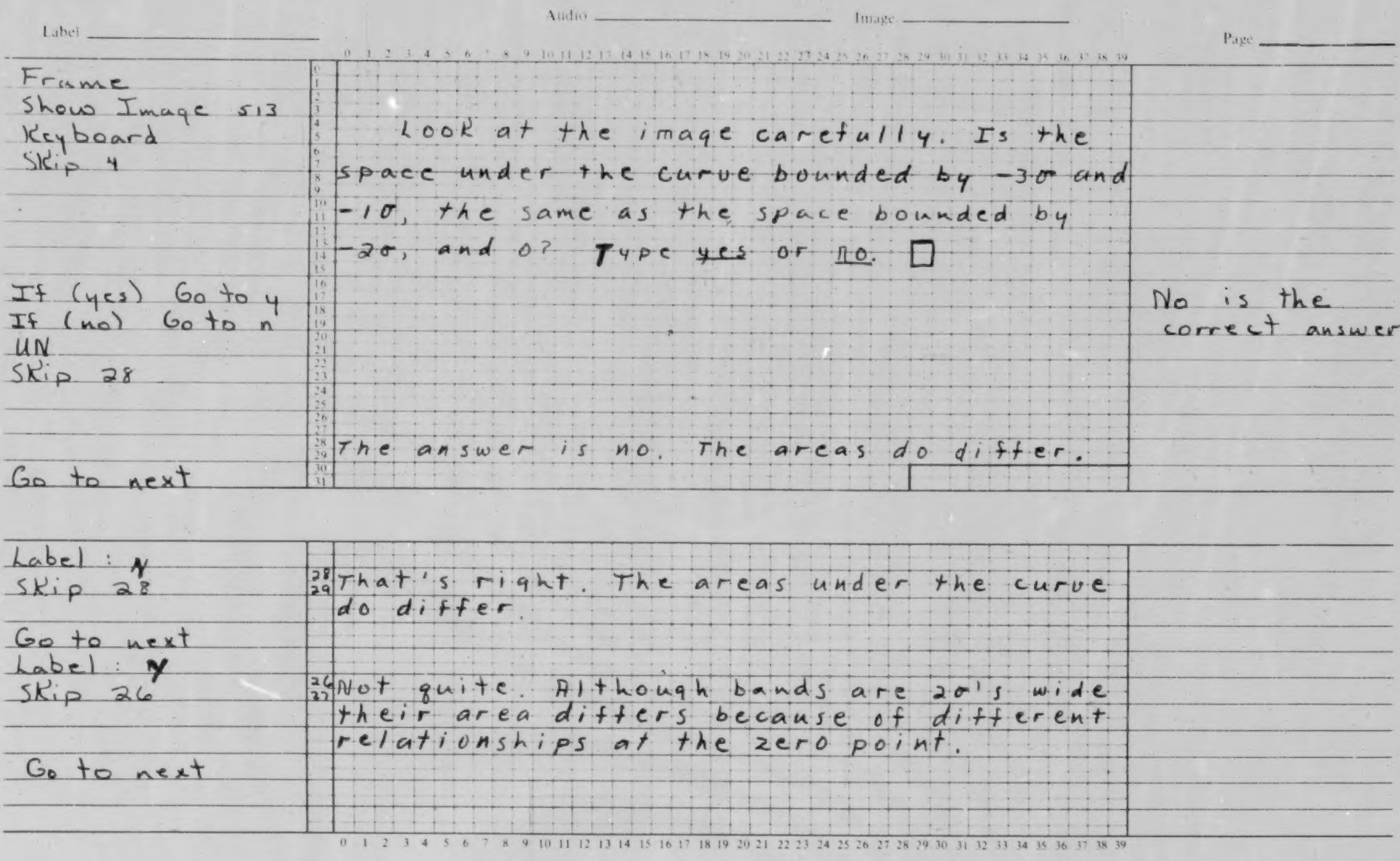
If the student's response does *not exactly* match the word(s) contained within the parentheses, the student will not branch to aaaa and the statement following the IF (---) GO TO aaaa will be examined.

An * may be used as a "don't care" character. When an * is used in place of a character, any character may appear in that location. When an * is used as the last character of the anticipated response, then all characters in the student's answer following the anticipated response are ignored. When an * is the only character within the parentheses, any student response is acceptable.

Example: (SCAISL pg. 32, frame 75) See Figure 2.15. (The instructional strategy is flowcharted in Figure 2.16). If the student types "yes", he will be shown the feedback associated with LABEL: y. If the student types "no", he will not go to y, but instead will be branched to LABEL: n where he will be presented with appropriate feedback. If he does not type"yes" or "no", he will be presented with the feedback associated with the UN.

It should be noted that if the student types YES, I THINK, that he will not match the answers as they are contained within the parentheses. In this case, the student would receive the feedback associated with the UN statement. If the author wanted to allow answers such as YES, I THINK, the IF statement should be in the following form:

BEST COPY AVAILABLE



Label ________ Audio ________ Image ________ Page ________

Label	Audio	
Frame Show Image 513 Keyboard Skip 4	Look at the image carefully. Is the space under the curve bounded by -3σ and -1σ, the same as the space bounded by -2σ, and 0? Type yes or no. ☐	

If (yes) Go to y
If (no) Go to n
UN
Skip 28
		No is the correct answer

Go to next	28 29 The answer is no. The areas do differ.	
Label : n Skip 28	28 29 That's right. The areas under the curve do differ.	
Go to next Label : y Skip 26	26 27 Not quite. Although bands are 2σ's wide their area differs because of different relationships at the zero point.	
Go to next		

Figure 2.15. Sample keyboard IF instruction.

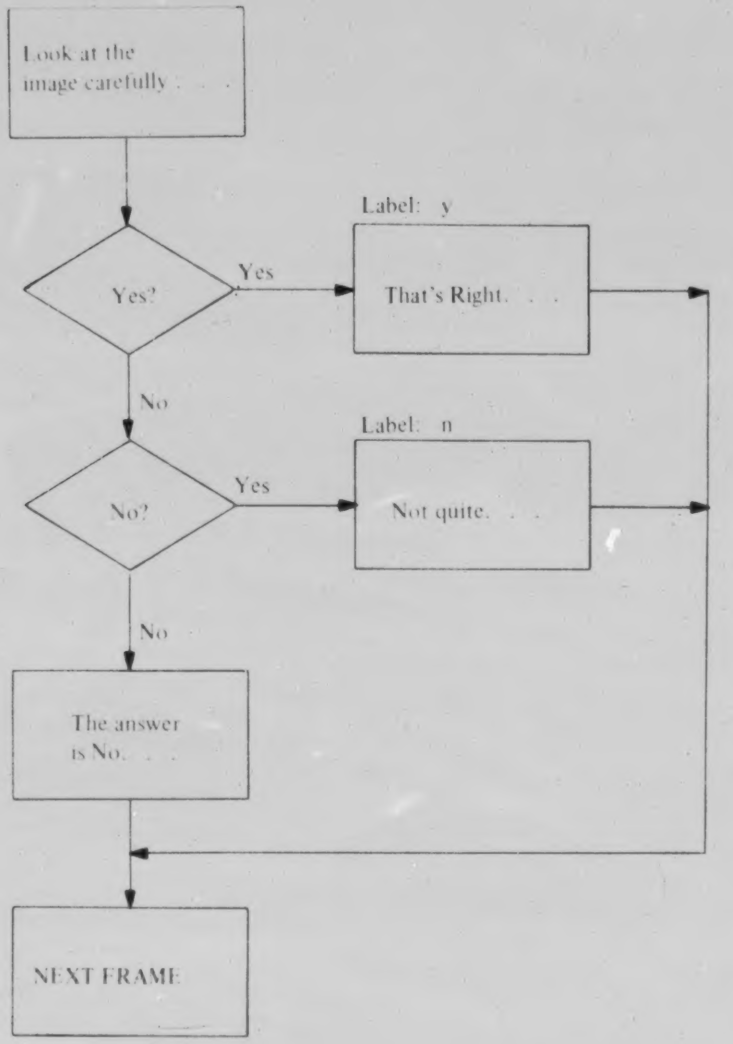

Look at the image carefully . . .
Label: y
Yes?
Yes
That's Right. . .
No
Label: n
No?
Yes
Not quite. . .
No
The answer is No. . .
NEXT FRAME

Figure 2.16.

IF (YES*) GO TO Y.

Then any characters typed after "yes" would be ignored and the student who typed YES, I THINK would be given the feedback located under the LABEL: y statement.

It should also be noted that if the student typed some character before YES, such as "Is the answer yes?" he would not receive the feedback at LABEL: y but would instead receive the feedback associated with the UN. The addition of an * before the YES would only allow the student to type one character before YES. The addition of two **'s before YES would only allow the student to type two characters before YES, etc.

It should also be noted that the student is not required to repeat the question after he answers the question. Since there are only two positive answers (YES or NO) the student knows which answer is correct as soon as he receives his feedback. In this case the author thought that no purpose would be served by having the student type in the correct answer after marking an error. Instead the student is allowed to go to the next frame regardless of his original answer.

The CLASS statement is a more flexible means of analyzing keyboard responses. The CLASS statement is used to define a class of possible answers which may consist of words, parts of words or groups of words. The symbols /(or), &(and) and -(not) may be used to indicate relationships.

FORMAT: **Class n = (---)**

Where n is a number from 1 to 6.

The CLASS statement is a definition to be used in conjunction with an IF statement rather than an instruction. The CLASS statement may be placed anywhere within the frame or chapter as long as the class definition precedes the IF instruction in which it is used. A class may be redefined at any time.

Logical Operator Hierarchy

The logical operators & (and), | (Or) and ¬(not) provide much of the flexibility gained by using the CLASS statement in conjunction with the IF statement. However, great care must be taken to insure that the student's response is evaluated in the desired manner, i.e., that incorrect answers do not satisfy a CLASS statement intended only to identify correct answers. When constructing CLASS statements, the logical operators are processed in the following order:

1) &'s (and) are processed from left to right
2) /'s (or) are processed from left to right
3) Pairs of words connected by the same operators are processed from left to right with each processed pair then being treated as a new term.

When using the 'not' sign (¬), it should be noted that 'not' is a sign of negation rather than an operator. Therefore, 'not' must always be preceeded by:

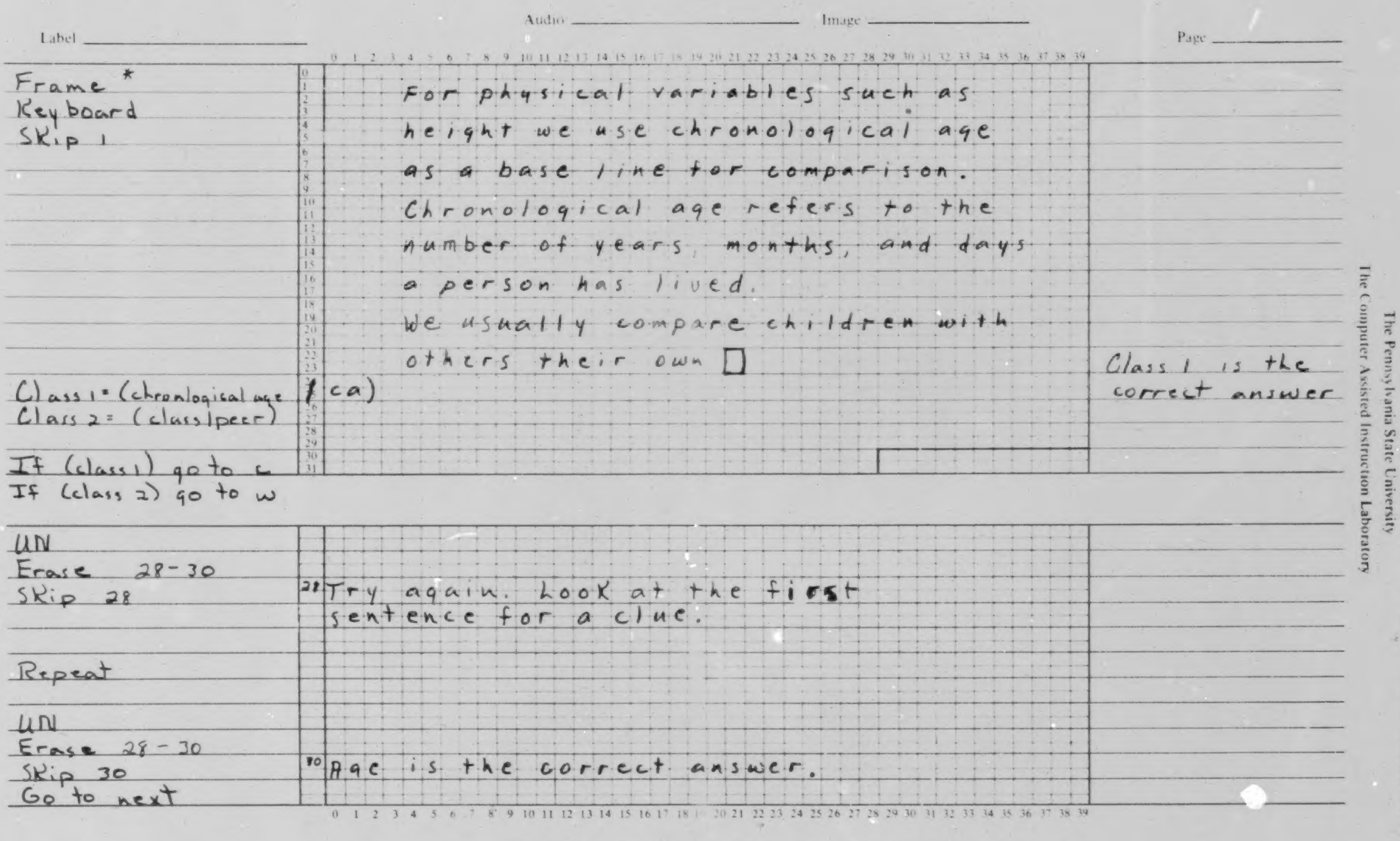
1) a left parenthesis
2) an & (ampersand) operator
3) an | (or) operator

Until one has had some experience in building classes, it is helpful to use only one type of logical operator in each class and consider each class as containing synonyms for one term.

Example: See Figure~~s~~ 2.17 and 2.18. (The instructional strategy is shown in a flowchart contained in Figure 2.19).

If the student types either "chronological age" or "CA", the feedback THAT'S CORRECT located under LABEL: c will be placed on the CRT. If the student types "class" *or* "peer" the feedback located under LABEL: w will be shown to the student after which he will be required to re-answer the question. If the student types anything else, he will be presented with the feedback located under the UN statement and then repeat the frame. The second time the student types an unanticipated response, AGE IS THE CORRECT ANSWER will appear on the screen and he will proceed to the next frame. It should be noted that other letters or words do not affect the evaluation. For example, if the student typed "Is chronological age the correct answer?", the response would match chronological age and the student would receive the feedback located under LABEL: c. Similarly, if the student typed "Either chronological age or class" the student would receive the feedback located under LABEL: c since "chronological age" was part of the student's answer which matched the IF (CLASS 1) GO TO c statement. To eliminate this possibility, *always check for wrong answers before checking for correct answers* If the TACL instructions were reordered so that IF (CLASS 2) GO TO w was followed by IF (CLASS 1) GO TO c, then the student who typed "either chronological age or class" would receive the feedback located under LABEL: w.

Example: See Figures 2.20, 2.21, and 2.22 (SCAISI, pg. 29, frame 62) (Figure 2.23 shows the flowchart of the instructional strategy). In this example the IF statement for the correct answer (DEVIATE) is evaluated after the student's answer has been evaluated to determine whether or not it contains incorrect answers. If the student were to type "The answer is either deviate or curve", he would be presented with the feedback located under LABEL: A "NO. WHAT DOES IT MEAN TO BE SEPARATED FROM A BASE OR REFERENCE POINT?" since CLASS 2 (CURVE) was contained in his answer. Furthermore, if the student typed "deviate, mean, or curve" he would still receive the same feedback. The student's answer is evaluated by the order in which the IF statements are executed and not by the order in which the student types the words.



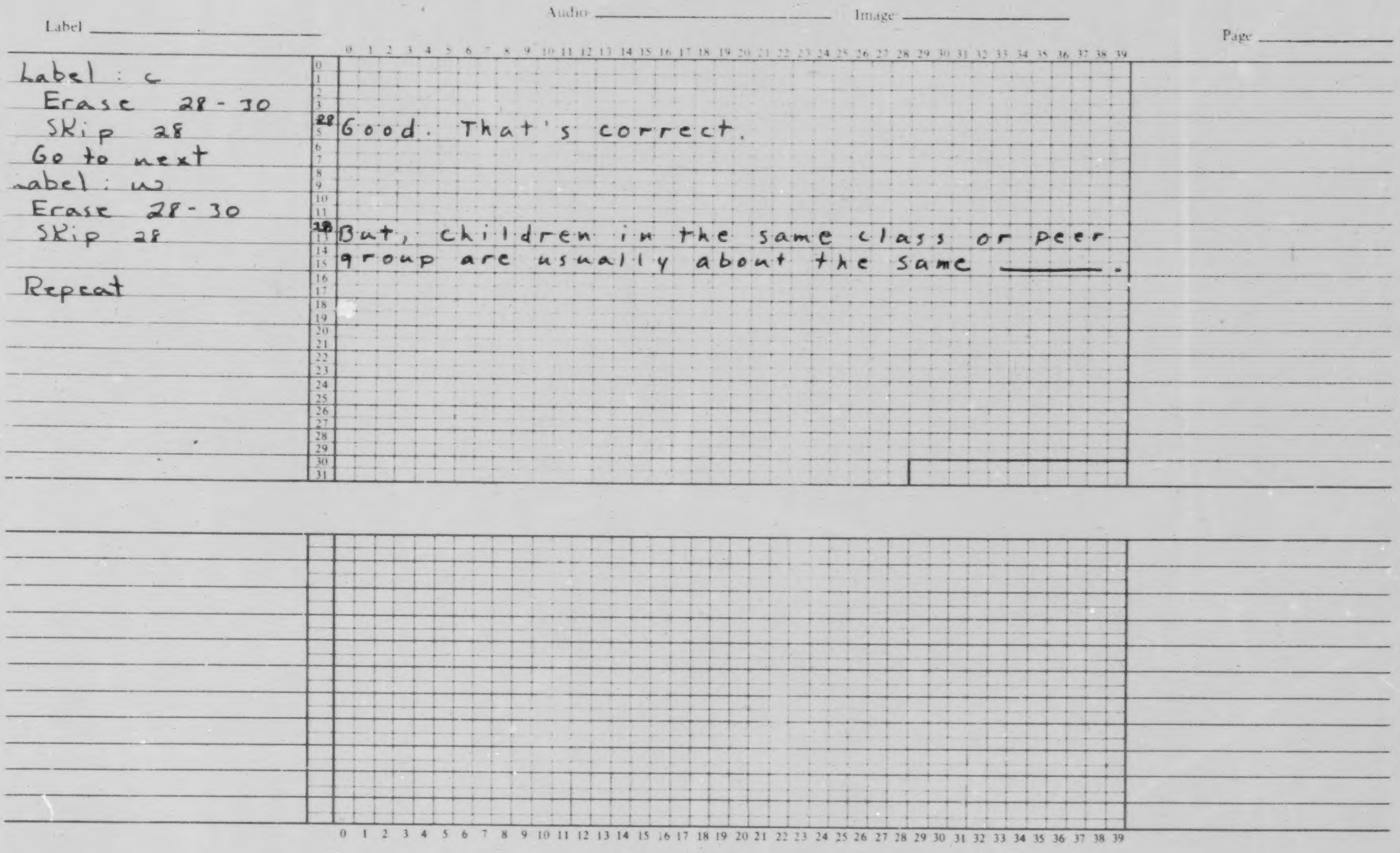
The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Frame *			
Keyboard		For physical variables such as	
Skip 1		height we use chronological age	
		as a base line for comparison.	
		Chronological age refers to the	
		number of years, months, and days	
		a person has lived.	
		We usually compare children with	
		others their own ☐	Class 1 is the correct answer
Class 1= (chronological age	/	ca)	
Class 2= (class|peer)			
If (class 1) go to c			
If (class 2) go to w			
UN			
Erase 28-30			
Skip 28	28	Try again. Look at the first sentence for a clue.	
Repeat			
UN			
Erase 28-30			
Skip 30	30	Age is the correct answer.	
Go to next			

Figure 2.17. Sample of CLASS instructions (2).

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label ______ Audio ______ Image ______ Page ______

Label : c
Erase 28 - 30
SKip 28
Go to next
Label : w
Erase 28 - 30
SKip 28

Repeat

28 Good. That's correct.

28 But, children in the same class or peer group are usually about the same ______.

Figure 2.18. Continuation of figure 2.17.

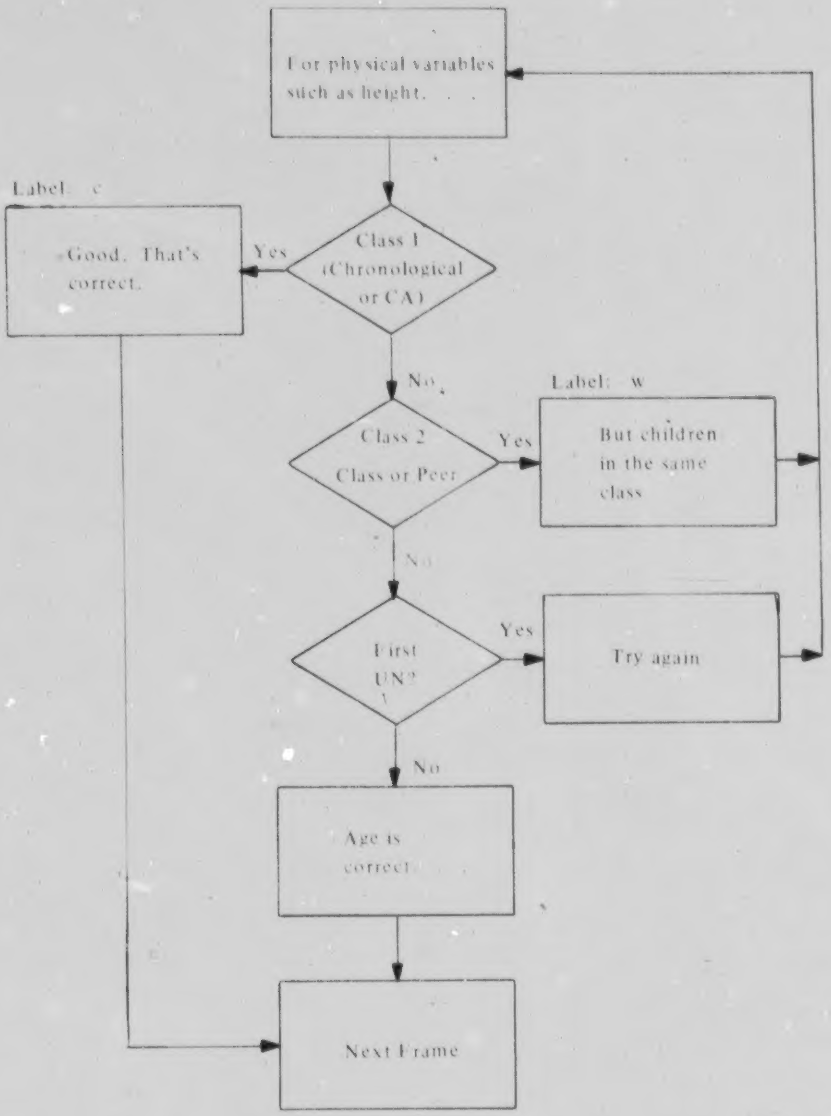
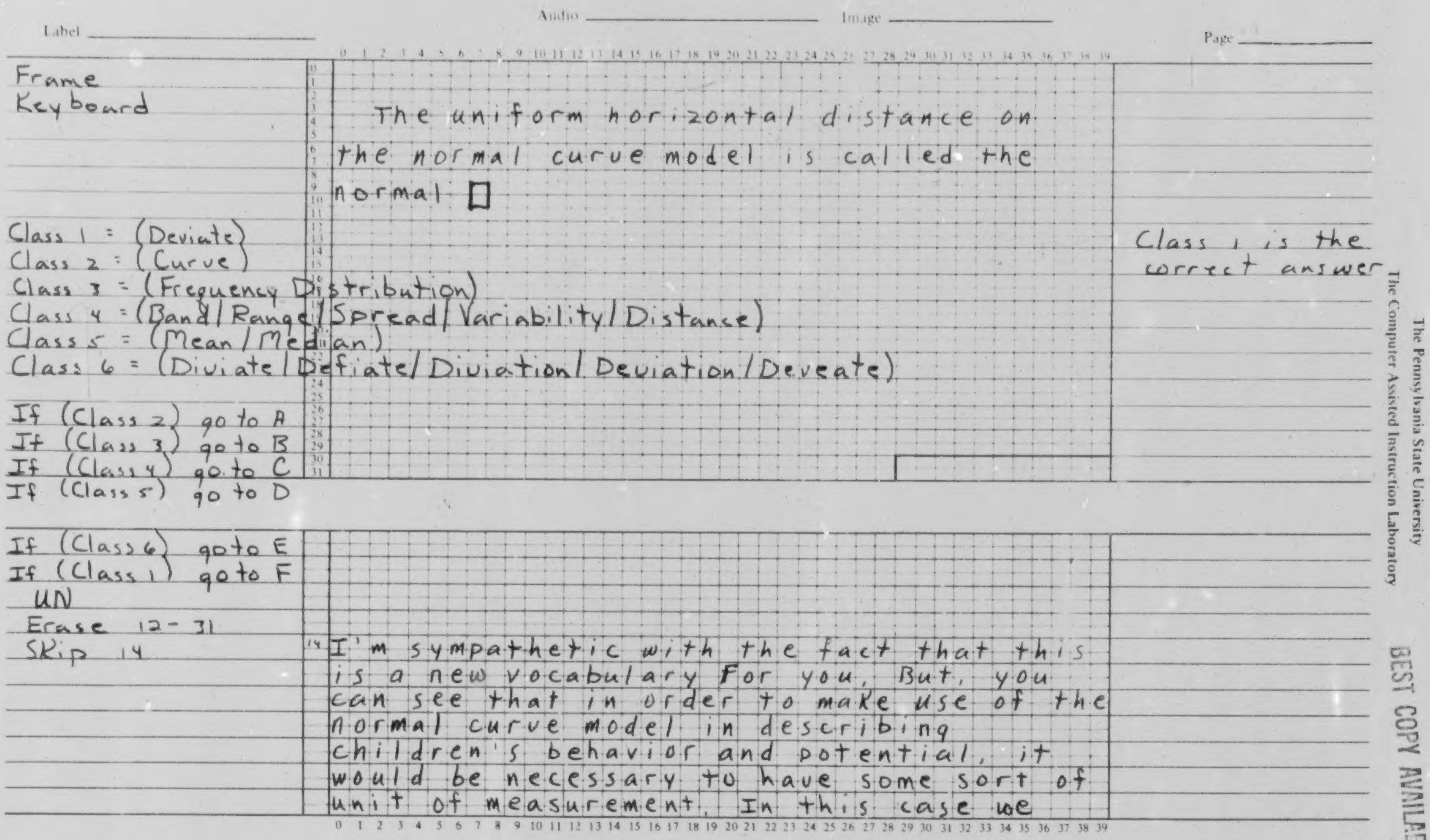


Figure 2.19. Flowchart of instructional strategy shown in figures 2.17 and 2.18.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Frame
Keyboard

The uniform horizontal distance on
the normal curve model is called the
normal ☐

Class 1 = (Deviate)
Class 2 = (Curve)
Class 3 = (Frequency Distribution)
Class 4 = (Band/Range/Spread/Variability/Distanse)
Class 5 = (Mean/Median)
Class 6 = (Diviate/Defiate/Diviation/Deviation/Deveate)

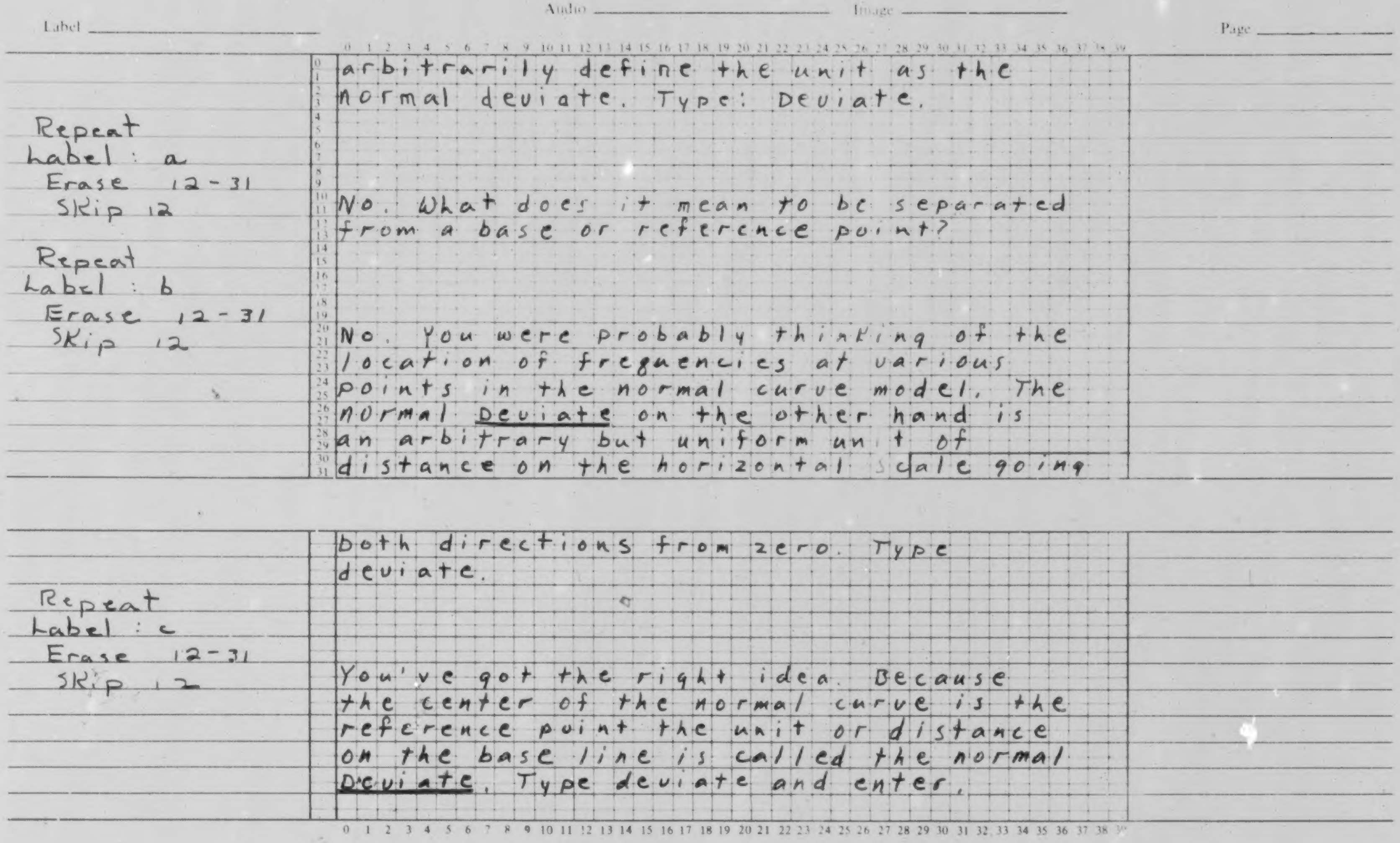
Class 1 is the correct answer

If (Class 2) go to A
If (Class 3) go to B
If (Class 4) go to C
If (Class 5) go to D

If (Class 6) goto E
If (Class 1) goto F
UN
Erase 12 - 31
Skip 14

14 I'm sympathetic with the fact that this
is a new vocabulary for you, But, you
can see that in order to make use of the
normal curve model in describing
children's behavior and potential, it
would be necessary to have some sort of
unit of measurement. In this case we

Figure 2.20. Sample of CLASS instruction.



Label ______ Audio ______ Image ______ Page ______

	arbitrarily define the unit as the normal deviate. Type: Deviate.
Repeat Label : a Erase 12 - 31 Skip 12	
	No. What does it mean to be separated from a base or reference point?
Repeat Label : b Erase 12 - 31 Skip 12	
	No. You were probably thinking of the location of frequencies at various points in the normal curve model. The normal Deviate on the other hand is an arbitrary but uniform unit of distance on the horizontal scale going

	both directions from zero. Type deviate.
Repeat Label : c Erase 12-31 Skip 12	
	You've got the right idea. Because the center of the normal curve is the reference point the unit or distance on the base line is called the normal Deviate. Type deviate and enter.

Figure 2.21. Continuation of figure 2.20.

Label ______ Audio ______ Image ______ Page ______

Repeat	
Label : d	
Erase 12 - 31	
Skip 14	mean or median identifies the central
	point of the normal curve where the
	frequencies are the most numerous. Our
	concern here is with a unit for measure-
	ing distance on the horizontal scale
	called the normal **Deviate**.
	Type devidte.
Repeat	
label : e	
Erase 12 - 31	
Skip 14	
	The answer you typed is essentially
	correct. But when referring to a
	hypothetical normal curve, **Deviate** is
	the more appropriate term.
Repeat	
Label : f	
Erase 12 - 31	
Skip 14	That's right. It's an arbitrary measure
	of distance away from the mean.
Go to next	

Figure 2.22. Continuation of figures 2.20 & 2.21.

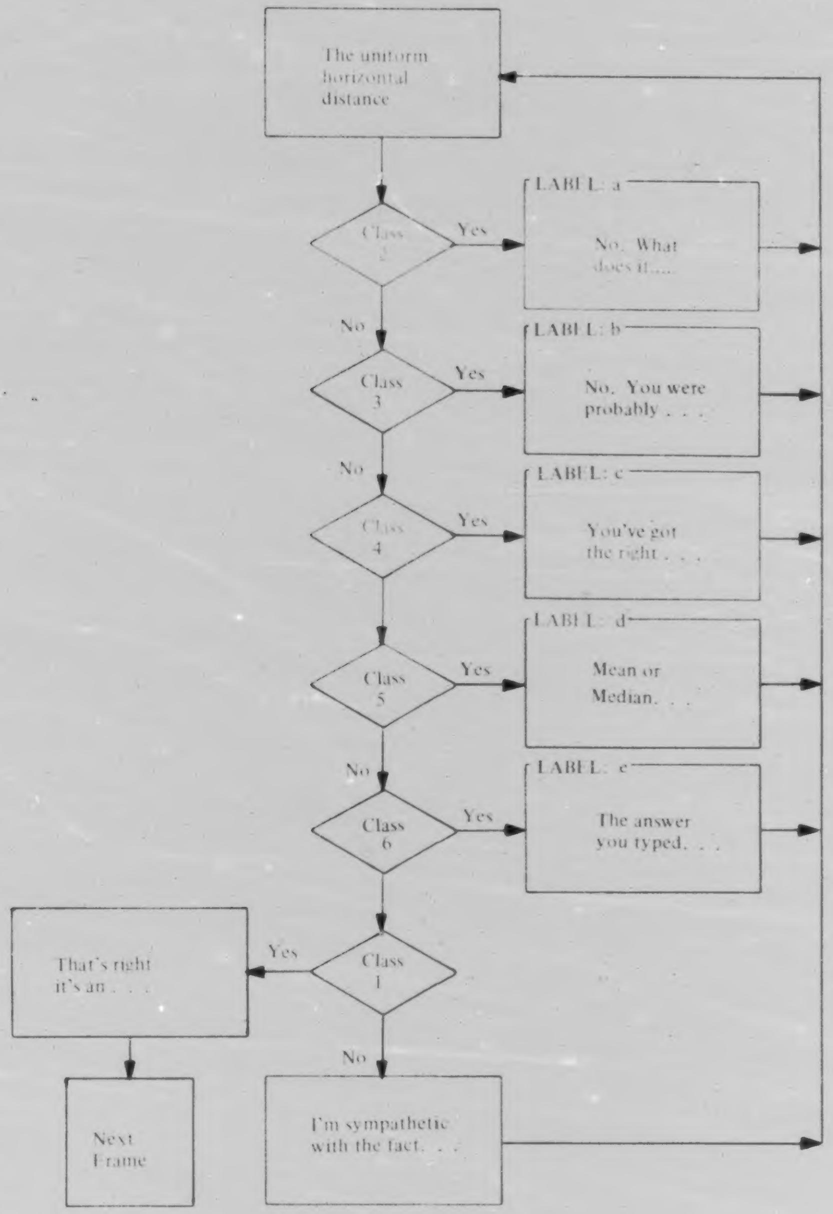

The uniform horizontal distance
Class 2
Yes
LABEL: a
No. What does it....
No
Class 3
Yes
LABEL: b
No. You were probably . . .
No
Class 4
Yes
LABEL: c
You've got the right . . .
Class 5
Yes
LABEL: d
Mean or Median. . .
No
Class 6
Yes
LABEL: e
The answer you typed. . .
Class 1
Yes
That's right it's an . . .
Next Frame
No
I'm sympathetic with the fact. . .

Figure 2.23. Flowchart of instructional strategy shown in figures 2.20, 2.21, and 2.22.

If the student typed:	He would be skipped to:
curve or mean	LABEL: a
mean or curve	LABEL: a
defiate	LABEL: e
defiate or deviate	LABEL: e
distance	LABEL: c
distance on curve	LABEL: a
deviate	LABEL: f

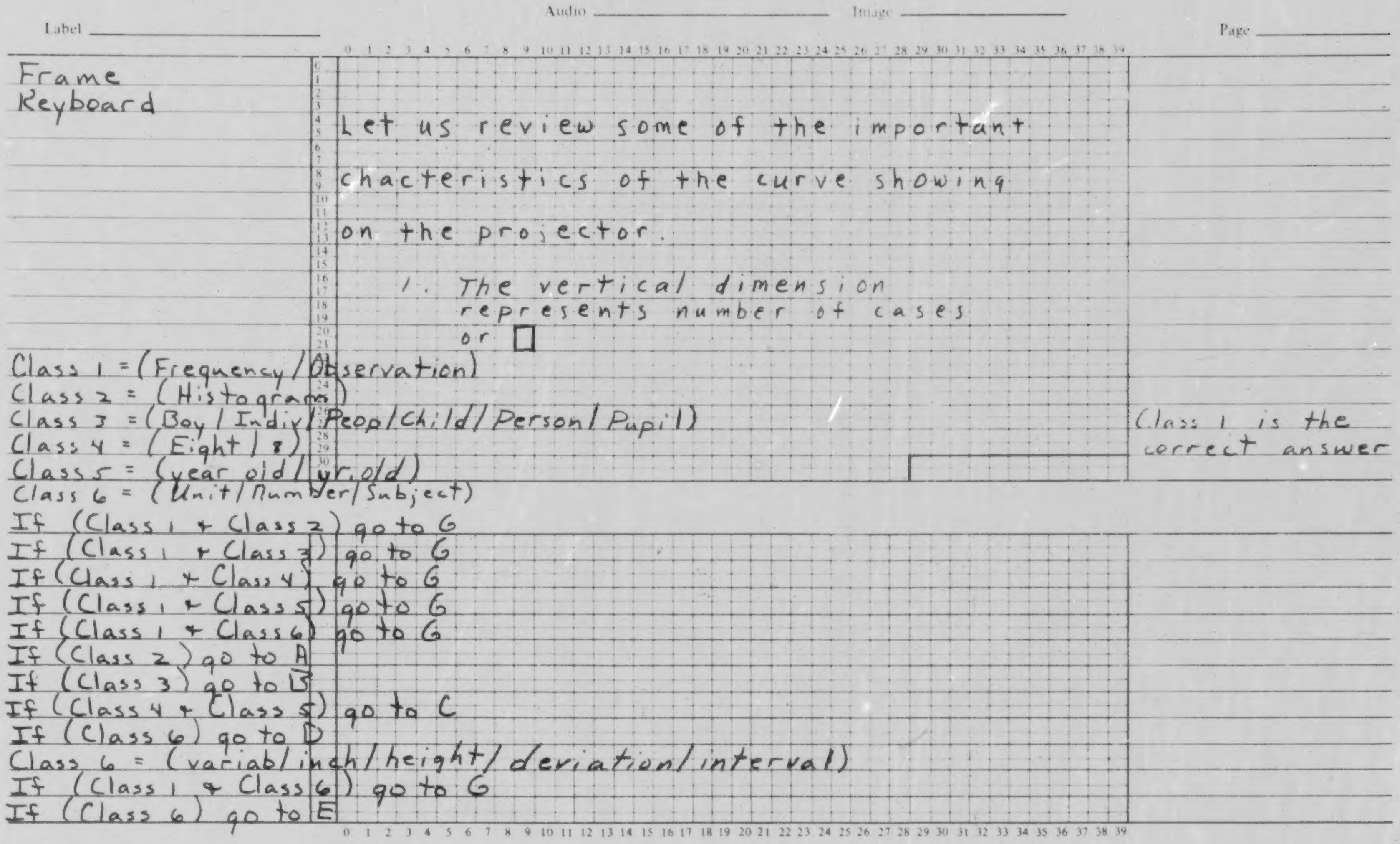
The program can also be written to let the student know that you know that he may be guessing. During the last two examples, the student's answer was only evaluated in terms of one wrong answer. The following example illustrates one possible procedure for identifying multiple answers.

Example: See Figures 2.24, 2.25, 2.26, 2.27 (SCAISI, pg. 22, frame 44) and accompanying flowchart in Figure2.28 In this example it should be noted that if the student enters a technically correct answer, even if the answer is not the desired answer, the student is told the correct answer and then skipped to the next frame (see the coding following LABEL: b and LABEL: c). In this frame the author decided that the student had the correct idea even though he did not use the exact answer.

This example also demonstrates that classes may be redefined within a frame. Note that CLASS 6 is first defined as "unit or number or subject." After the student's answer has been evaluated according to the criterion contained in CLASS 6 and after the original definition of CLASS 6 was no longer required, CLASS 6 was redefined as "variant, or inch, or height, or deviation, or interval" and the subsequent IF statements using CLASS 6 were evaluated using the new definition. *Any class may be redefined at any point within a frame after the previous definition has served its purpose.*

Also note that CLASS 3 contains parts of words, e.g., child, indiv and peop. As long as these part-words are contained in the student's answer, the student's response will match the IF (CLASS 3) statements and the program will go to LABEL: b. The use of part words insures a match if the student types "child" or "children", "individual" or "individuals", "people" or "peoples" etc.

This example also illustrates one method of determining if the student is typing more than one possible answer where one of the student's answers is the correct one.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Frame
Keyboard

Let us review some of the important

chacteristics of the curve showing

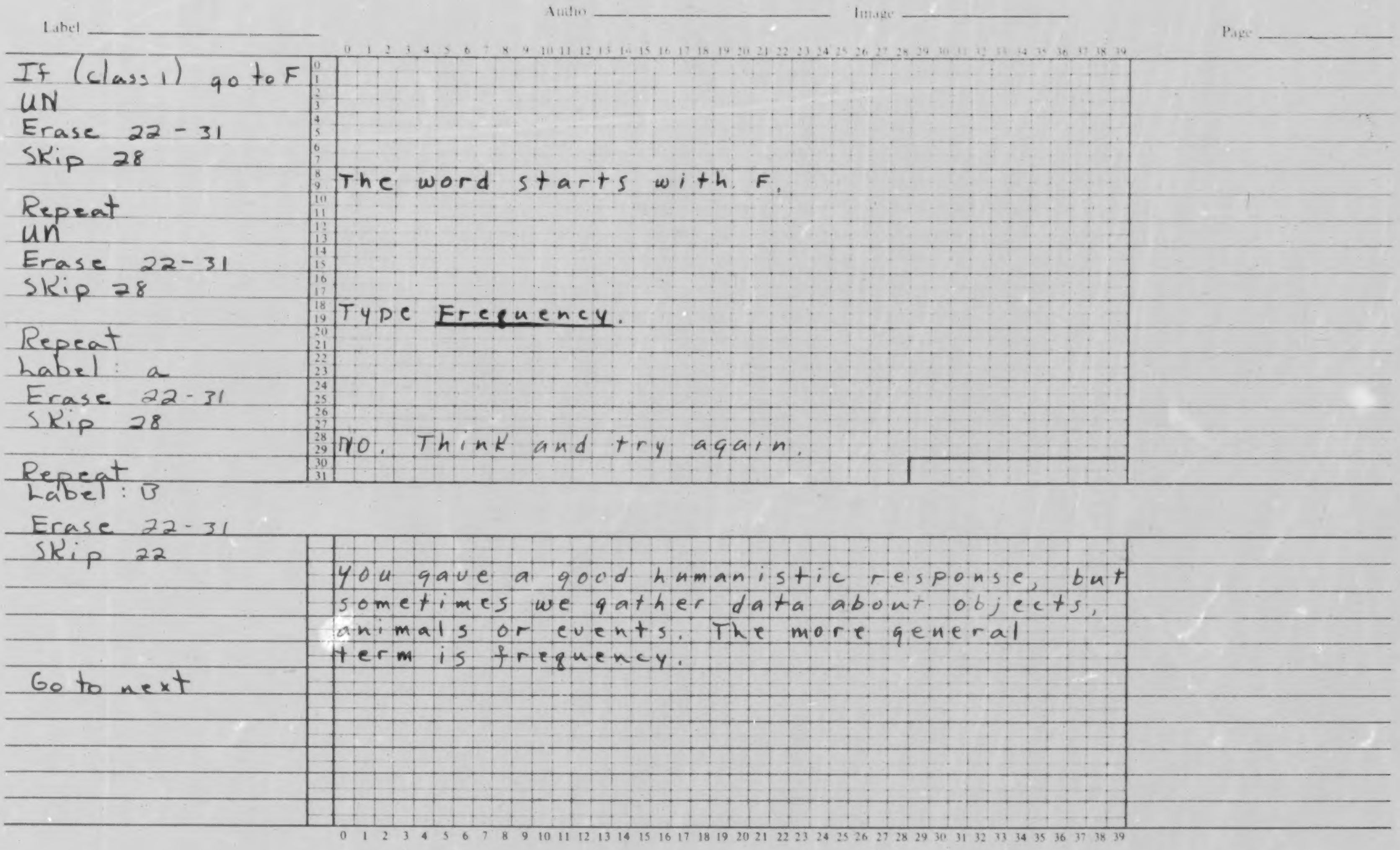
on the projector.

1. The vertical dimension
represents number of cases
or ☐

(Class 1 is the
correct answer

```
Class 1 =(Frequency/Observation)
Class 2 = (Histogram)
Class 3 =(Boy/Indiv/Peop/Child/Person/Pupil)
Class 4 = (Eight/8)
Class 5 = (year old/yr.old)
Class 6 = (Unit/Number/Subject)
If (Class 1 + Class 2) go to G
If (Class 1 + Class 3) go to G
If (Class 1 + Class 4) go to G
If (Class 1 + Class 5) go to G
If (Class 1 + Class 6) go to G
If (Class 2) go to A
If (Class 3) go to B
If (Class 4 + Class 5) go to C
If (Class 6) go to D
Class 6 = (variabl/inch/height/deviation/interval)
If (Class 1 + Class 6) go to G
If (Class 6) go to E
```

Figure 2.24. Sample of CLASS instructions (3).



Label ______ Audio ______ Image ______ Page ______

If (class 1) go to F
UN
Erase 22 - 31
Skip 28

The word starts with F.

Repeat
UN
Erase 22-31
Skip 28

Type Frequency.

Repeat
Label: a
Erase 22-31
Skip 28

NO. Think and try again.

Repeat
Label: B
Erase 22-31
Skip 22

You gave a good humanistic response, but
sometimes we gather data about objects,
animals or events. The more general
term is frequency.

Go to next

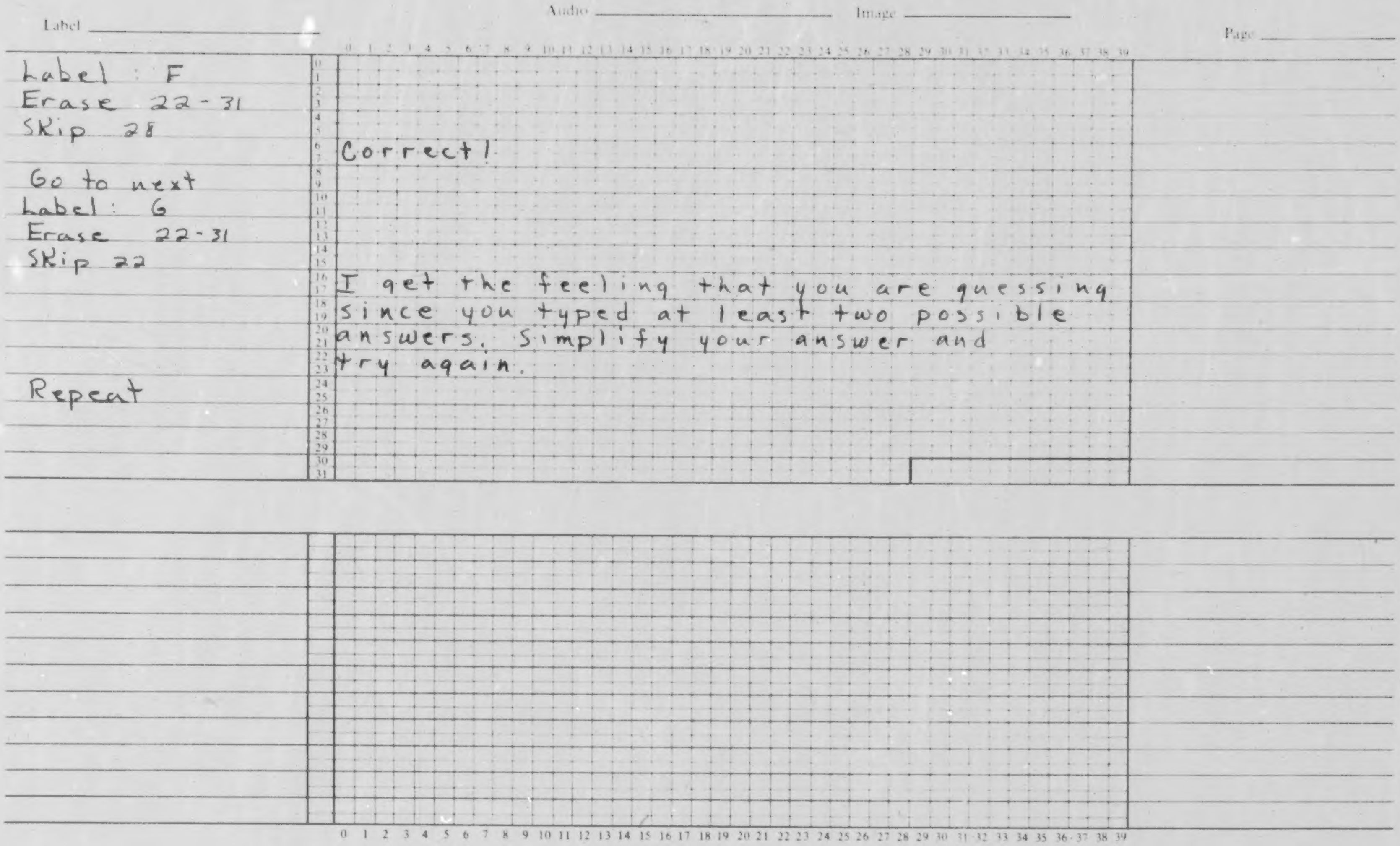
Figure 2.25. Continuation of figure 2.24.

Label ______ Audio ______ Image ______ Page ______

Label: c Erase 22 - 31 Skip 22	When you answered "8 year olds" you gave a good humanistic response, but sometimes we gather data about objects, animals or events. The more general term is "frequency".
Go to next Label: d Erase 22 - 31 Skip 22	You gave a satisfactory general response. In educational measurement the technical term is frequency.
Repeat Label: c Erase 22-31 Skip 22	You gave a response associated with the horizontal dimension of the figure instead of the vertical. The vertical dimension represents frequency of occurrences. Type: frequency.
Repeat	

Figure 2.26. Continuation of figures 2.24 & 2.25.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label ______ Audio ______ Image ______ Page ______

Label : F
Erase 22-31
SKip 28

Correct!

Go to next
Label : G
Erase 22-31
SKip 22

I get the feeling that you are guessing since you typed at least two possible answers. Simplify your answer and try again.

Repeat

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Figure 2.27. Continuation of figures 2.24, 2.25 & 2.26.

BEST COPY AVAILABLE

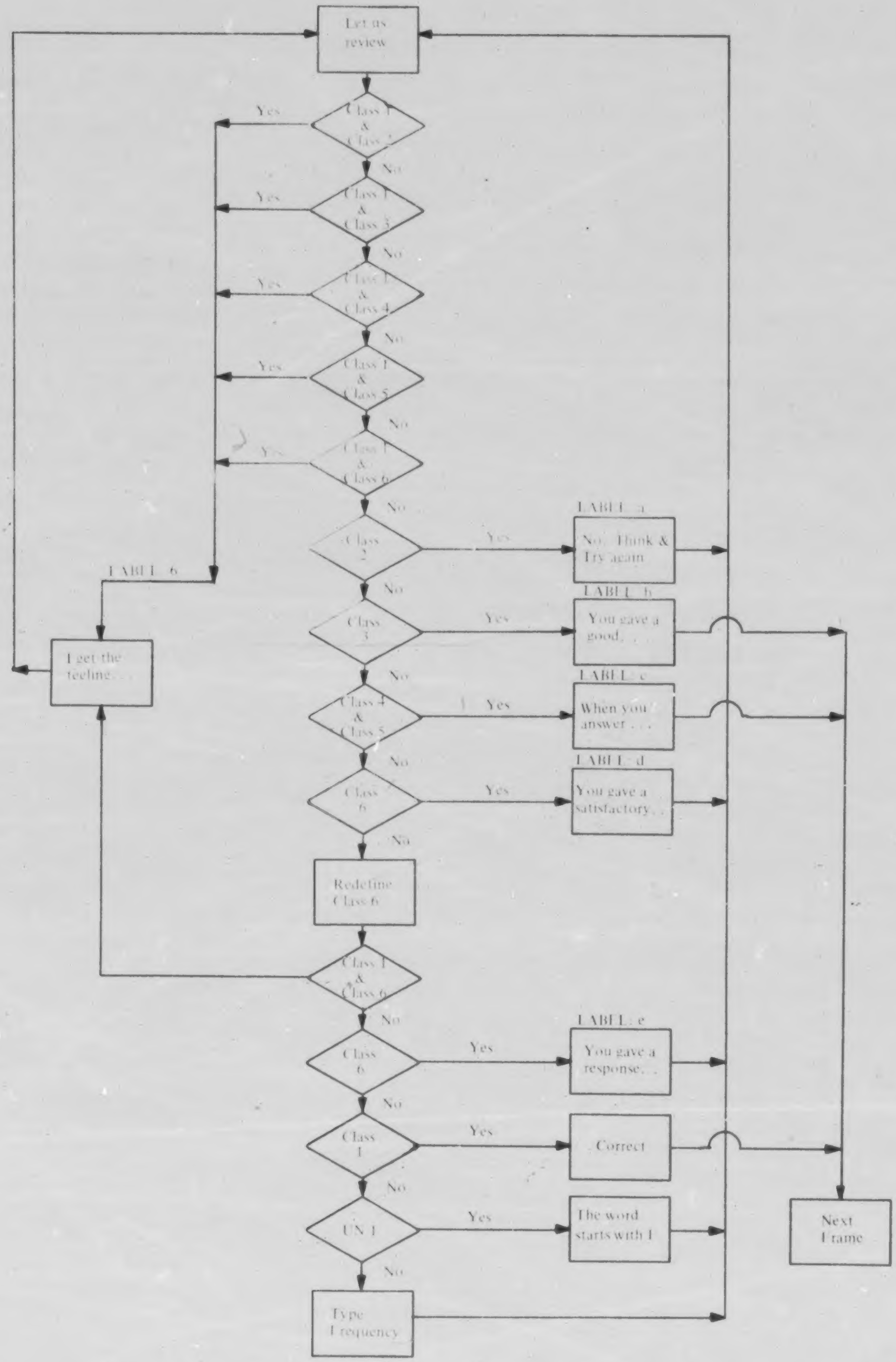


Figure 2.28. Flowchart of instructional strategy shown in figures 2.24, 2.25, 2.26, and 2.27.

If the student types:	He will be skipped to:
frequency or histogram	LABEL: G
the answer is subject or observation	LABEL: G
is the answer frequency, histogram, child or unit?	LABEL: G
unit interval	LABEL: D
histogram	LABEL: A
frequency	LABEL: F
subject	LABEL: D
inches	LABEL: E
I don't know	FIRST UN
I give up	SECOND UN
I still give up	SECOND UN
child	LABEL: B
children	LABEL: B

If it were important to the author, unique feedback for each combination of answers could be provided in place of the generalized feedback at LABEL: G. Obviously, the student's answer could be evaluated if it contains other combinations of possible answers such as IF (CLASS 4 and not CLASS 5) GO TO z, etc. depending on the author's objective.

The use of the CLASS statements and the logical operators provide a very powerful means of analyzing student responses. However, great care must be taken to construct the classes in a meaningful way so as not to include unwanted answers. After the chapter appears on line, one should always test the response analysis statements to insure that the author's intent was accomplished. Until one gathers sufficient experience in creating IF and CLASS statements, one would be well advised to create simple answer processing statements.

Score Keeping

Response contingent feedback is but one way to individualize a CAI course. A second, more powerful means of individualizing a course is to modify the course flow based on each student's performance. To accomplish that objective it becomes necessary to record or keep score of each student's performance. The score keeping is accomplished through the use of up to ten variables, where each variable consists of a one-to-four-character name beginning with an alphabetic character. One may consider the variables as belonging to only one student, since each student has his own set of variables. Each student modifies only his own set of variables. The variables are not used for collecting data across all students. Instead they are used for collecting data on the student currently taking the course.

Replacement statements. Replacement statements are used to modify the value of a variable.

FORMAT: **Variable = algebraic expression**

where variable is a one-to-four-character name beginning with a letter.

The operators: = for equal, + for addition; - for subtraction; * for multiplication; and / for division, may be contained within the algebraic expression.

Example: SUM = 0

the variable SUM will be set to 0

This should be done to initialize a variable.

Example: SUM = SUM + 1

the value of sum will be incremented by one.

Example: SUM = SUM - 1

the value of sum will be decremented by one.

Example: SUM = SUM + SUMA

the value of SUMA will be added to the value of SUM and the results will be stored in SUM. If the value of SUM was 12 and the value of SUMA was 17, the value of SUM would be 29 after the statement was processed.

Example:

```
SUMB = 25
SUMC = 19
SUMA = SUMB + SUMC
```

After the execution of the addition statement, SUMA will contain 44.

Example: SUM = SUMA *5

If SUMA contained 4, SUM would contain 20 after the statement was executed.

Example: SUM = SUMA/6

If SUMA contained 72, SUM would contain 12 after the statement was processed.

Restrictions

1. The values of any of the variables must be between -32768 and +32767.
2. If the range is exceeded during addition or subtraction, the result will change signs i.e., the answer exceeds +32767 it will become negative. If the results exceed -32768, the answer will become positive.

   Example: SUM = 32767
   SUM = SUM + 10

   Since the value of SUM will exceed +32767, the value of SUM will be -32759 after the statements are processed.

   Example: SUM = -32767
   SUM = SUM -10

   After the statements are processed SUM will contain +32758 because the actual answer would have been less than -32768.

3. If the result of a multiplication problem exceeds 32767, 32767 will become the value.
4. If the result of a multiplication problem is less than -32768, -32768 will become the answer.
5. Remainders are lost during division.

   Example: SUM = 12
   SUM = SUM/5

   After execution of the division statement, SUM will contain 2.

6. If an attempt is made to divide by zero, zero will become the answer.
7. A maximum of three variables and/or constants may be contained in each algebraic expression.

Variable Evaluation

Once data have been collected, the course can be tailored to fit the student by skipping to a section of the chapter if the student met some predefined criteria. This is accomplished by using an IF statement in the following manner:

FORMAT: IF (X.OP.Y) GO TO aaaa

Where: X is a variable name of one to four characters which was defined earlier in the course.

Op is an operation defined as follows:

LT which means "less than"
LE which means "less than or equal to"
EQ which means "equal to"
NE which means "not equal to"
GT which means "greater than"
GE which means "greater than or equal to"

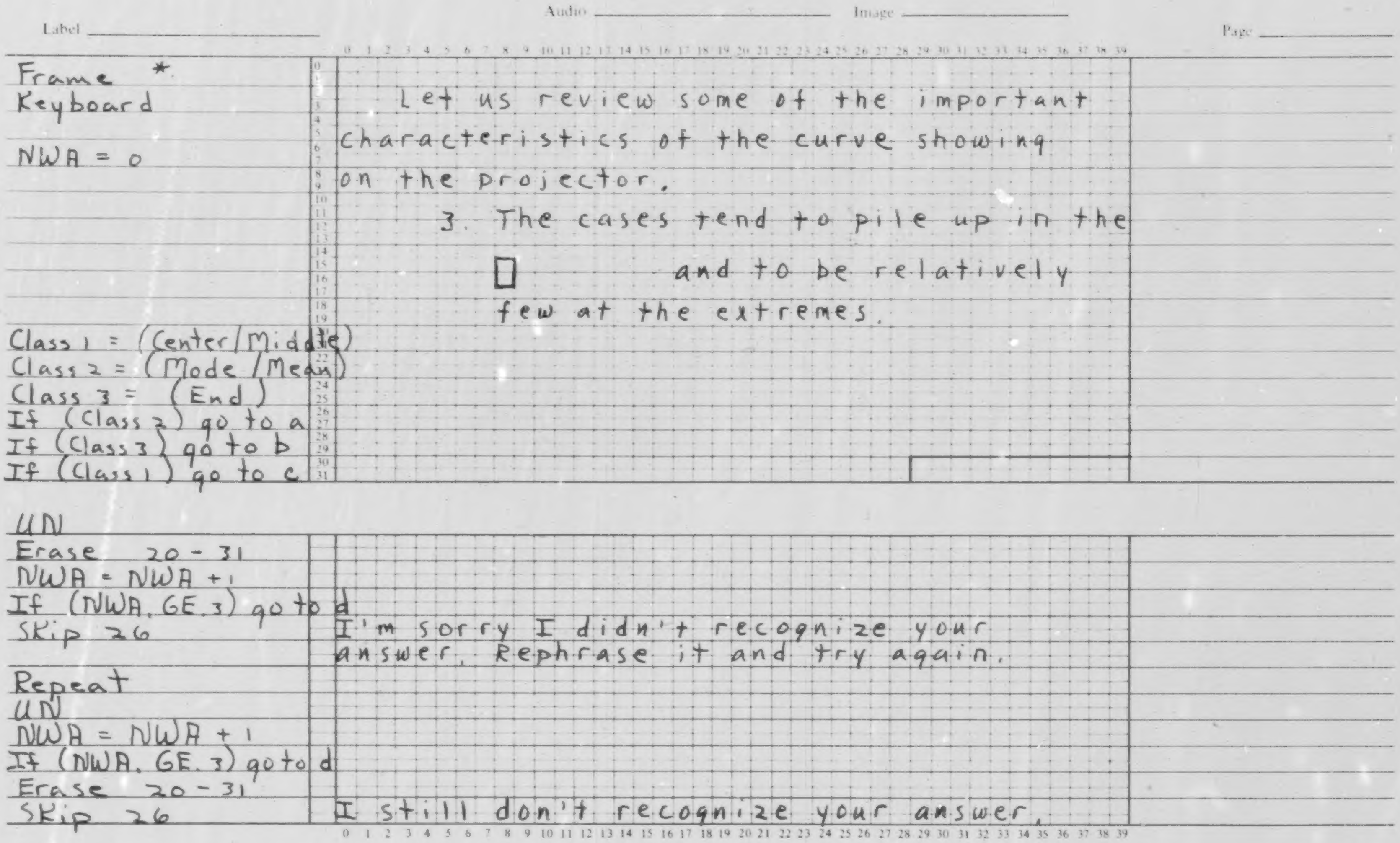
Y is a variable name which was defined earlier in the course or a constant. aaaa is:

1) a single alphabetic character which was defined by a LABEL instruction in the same frame.
2) a two-to-four-character label.
3) NEXT which refers to the beginning of the next frame.

Example: See Figures 2.29 and 2.30 (SCAISI, pg. 23, frame 48) and the flowchart shown in Figure 2.31. In this example, the author did not want the student to type more than three incorrect answers. The author thought that if the student typed more than three incorrect answers that he probably was playing games with the computer or really needed more help. The author accomplished his objective with the use of the variable NWA (Number of wrong answers). Note that at the beginning of the frame, the variable NWA is set to zero, then at each wrong answer (LABEL: a or LABEL: b) or unanticipated answer, NWA is incremented and the variable NWA is evaluated to determine if it's greater than or equal to 3. If the student answered three incorrect responses, in any order, he is skipped to LABEL: d and told to ask the proctor for help. A typical sequence may be as follows:

If the student types:	he is skipped to:
I DON'T KNOW	UN1
END	LABEL: b
MEAN	LABEL: d

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label
Audio
Image
Page

Frame *	
Keyboard	Let us review some of the important
	characteristics of the curve showing
NWA = 0	on the projector.
	3. The cases tend to pile up in the
	☐ and to be relatively
	few at the extremes.
Class 1 = (Center/Middle)	
Class 2 = (Mode/Mean)	
Class 3 = (End)	
If (Class 2) go to a	
If (Class 3) go to b	
If (Class 1) go to c	
UN	
Erase 20 - 31	
NWA = NWA + 1	
If (NWA.GE.3) go to d	
Skip 26	I'm sorry I didn't recognize your
	answer. Rephrase it and try again.
Repeat	
UN	
NWA = NWA + 1	
If (NWA.GE.3) go to d	
Erase 20 - 31	
Skip 26	I still don't recognize your answer.

Figure 2.29. Sample of scorekeeping instructions.

Label ____ Audio ____ Image ____ Page ____

	Please try again.
Repeat	
Label: a	
Erase 20 - 31	
NWA = NWA +1	
If (NWA. GE.3) go to d	
Skip 24	You have identified a descriptive statistic for frequency distributions, In what part of the distribution is this statistic located?
Repeat	
label b	
Erase 20 - 31	
NWA = NWA + 1	
If (NWA. GE.3) go to d	
Skip 24	No. Center or middle is correct.
Repeat	
Label: c	
Erase 20 - 31	
Skip 28	First rate!
Go to next	
Label: d	
Erase 20 - 31	
Skip 20	You seem to either be playing games with the computer or you are having trouble. Since your last three answers were incorrect, Ask the proctor for assistance.
Pause	

Figure 2.30. Continuation of figure 2.29.

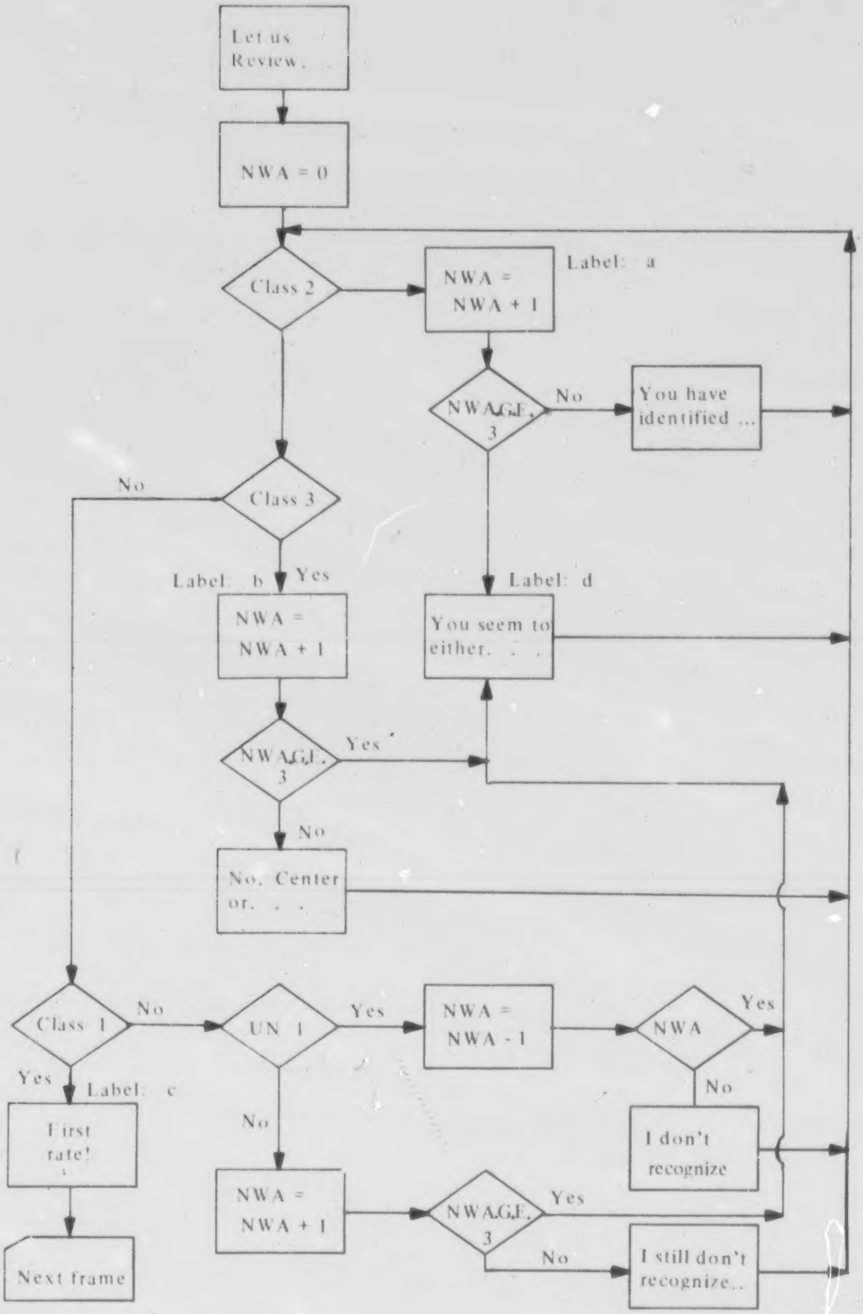


Figure 2.31. Flowchart of instructional strategy shown in figures 2.29 and 2.30.

CHAPTER THREE

ADVANCED TACL INSTRUCTIONS

Frame Identification

In addition to the FRAME instruction other variations of the FRAME instruction are available for special purposes.

FORMAT: FRAME 2

The FRAME 2 instruction duplicates many of the functions of the FRAME instruction except that it does not place an [sp] in the lower right hand corner of the CRT and does not pause until the student presses the space bar. Specifically the FRAME 2 instruction:

1. Erases the CRT
2. Produces a new frame label (analgous to a page number) in the lower right hand corner of the CRT.

It should be noted that the FRAME 2 instruction does not allow the student to control the amount of time a display remains on the CRT. Therefore, care should be taken when using this instruction.

FORMAT: FRAME 2*

As in the FRAME instruction, an * is used to identify a restart point - the point at which a student will resume progress through the course if he had signed off after passing through the restart point..

Another version of the FRAME Instruction is used as a place holder. The frames are always numbered sequentially. If a new frame is added between frame n and frame n + 1, the new frame will be labeled n + 1, and frame n + 1 will become n + 2. Correspondingly, if a frame is deleted from the program all of the frame numbers will be readjusted so that there will be no missing frame numbers. *Every time a frame is added or deleted, the frame numbers of the remaining frames will be changed.* However, the capability does exist to insert blank frames as placeholders.

FORMAT: FRAME 3

The sole purpose of this instruction is to increment the frame count by one frame. No other action is a result of executing the FRAME 3 instruction. FRAME 3 is most often used after a chapter becomes operational and when data on student performance have been collected. Since student performance data are identified by frame number, changing frame numbers makes interpretation and cross checking very difficult. Generally speaking, after a course is operational and if a frame needs to be deleted, a FRAME 3 instruction should be used to replace a deleted frame so that the following frame maintains the same frame number.

Displaying Text

The 1510 CRT is capable of displaying standard text and punctuation as well as simple line drawings and special characters. If one looks very closely at text displayed on the CRT it can be seen that each character is made up of several, individual points of light. Each character is constructed by "turning on" individual points of light witH a matrix 8 columns wide by 12 rows high. Figure 3.1 shows the dot representation for each of the 128 characters comprising the "standard dictionary." The dot representation of each character can be defined by course authors. A number of special dictionaries have been developed at Penn State to serve the needs of various authors. Figure 3.2 shows the dot representation of the characters contained in the Math-Science Dictionary. Note the presence of the Greek alphabet and the superscripts which may also be used as subscripts.

There are several ways in which line drawings may be displayed on the CRT. Figure 3.3 shows the dot representation of the characters presented in the geometric dictionary. Examination of Figure 3.3 shows that the characters are line segments rather than recognizable characters. By manipulating the cursor using the space bar, backspace, index or reverse index keys one may construct simple line drawings.

Example: If the author wanted a 15° line to appear on the CRT, characters u, v, w, x, and y of the geometric dictionary would produce the result (see Figure 3.4). To continue the line beyond 5 characters, one would do a double reverse index and again press the keys u, v, w, x, and y.

Example: Figure 3.5 shows the geometric dictionary characters which would be used to draw a 6-character-tall circle on the CRT.

Reference: Additional information on the use of the geometric dictionary can be obtained in:

Peloquin, Paul V. *1500 System Geometric Dictionary*. Report No. R-16, Computer-Assisted Instruction Laboratory, The Pennsylvania State University, June, 1968.

A fourth dictionary, called dot dictionary (see Figure 3.6) is available for more detailed drawings. In the dot dictionary each character represents a dot on the CRT instead of a line segment as contained in the geometric dictionary.

At Penn State, the dictionaries just described are available to each course and may be used at any time. The dictionaries are identified as follows:

Dictionary 0	Standard Dictionary
Dictionary 1	Math-Science Dictionary
Dictionary 2	Graphic Dictionary
Dictionary 3	Dot Dictionary

BEST COPY AVAILABLE

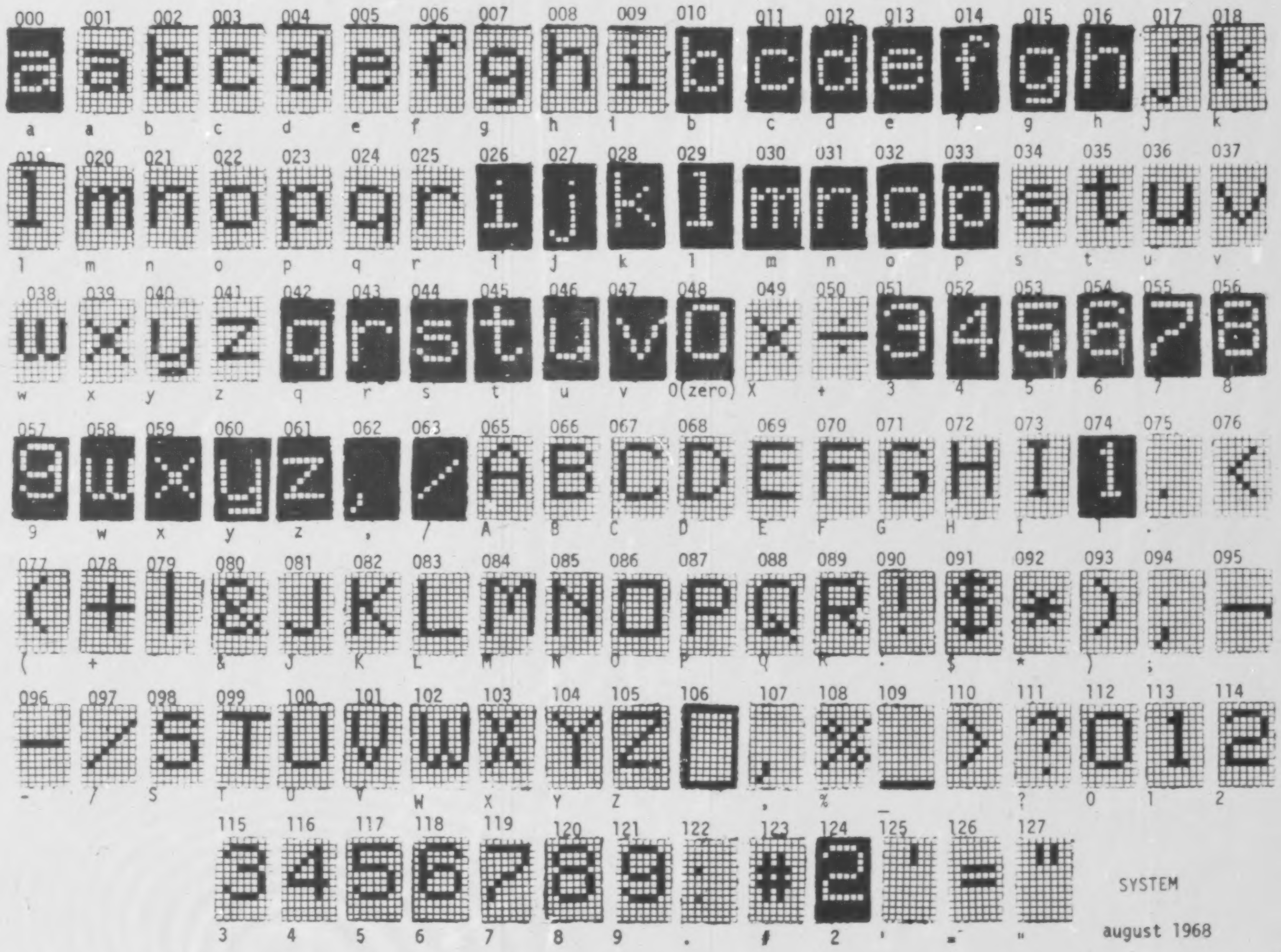
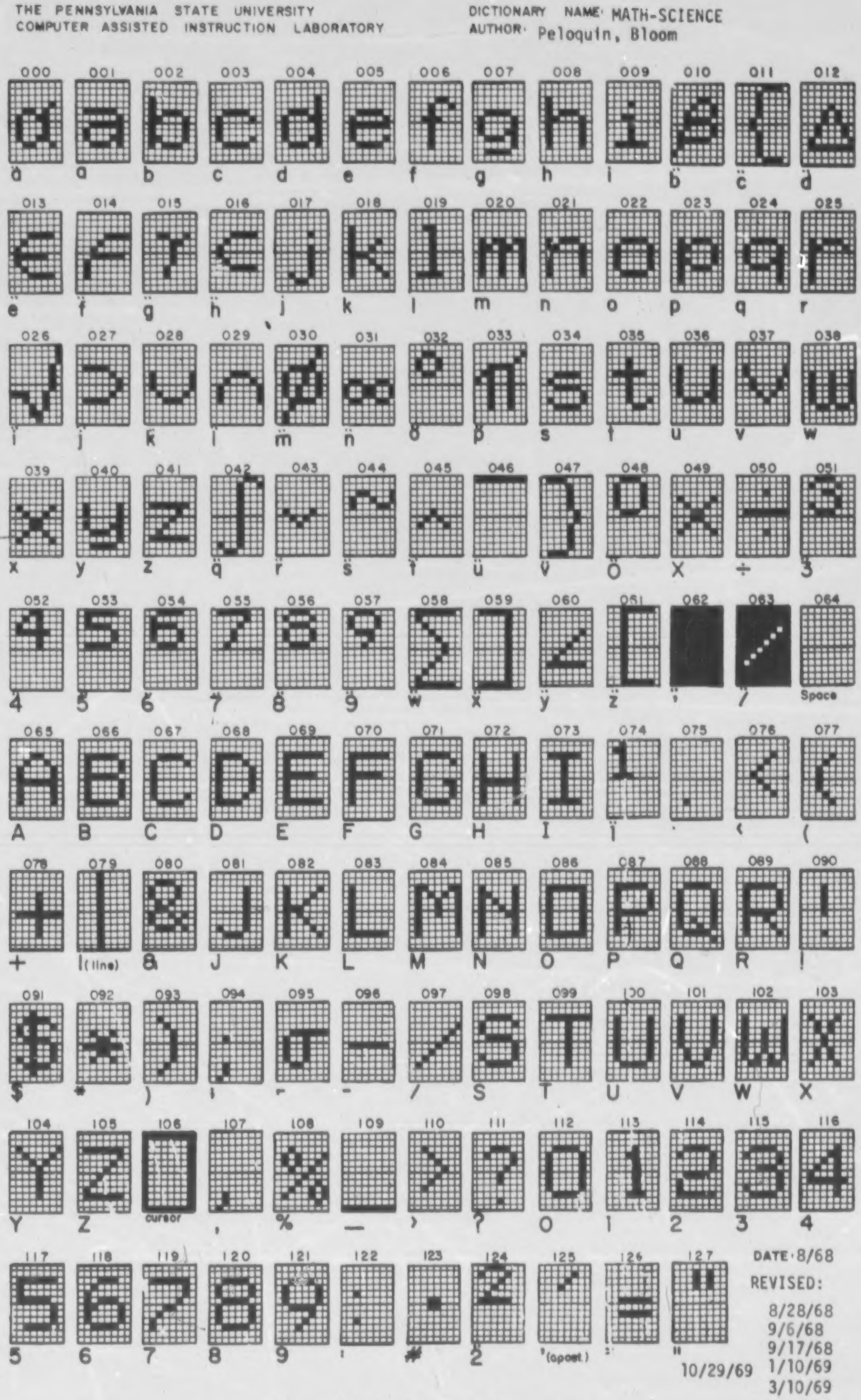


Figure 3.1. Standard dictionary.



THE PENNSYLVANIA STATE UNIVERSITY
COMPUTER ASSISTED INSTRUCTION LABORATORY

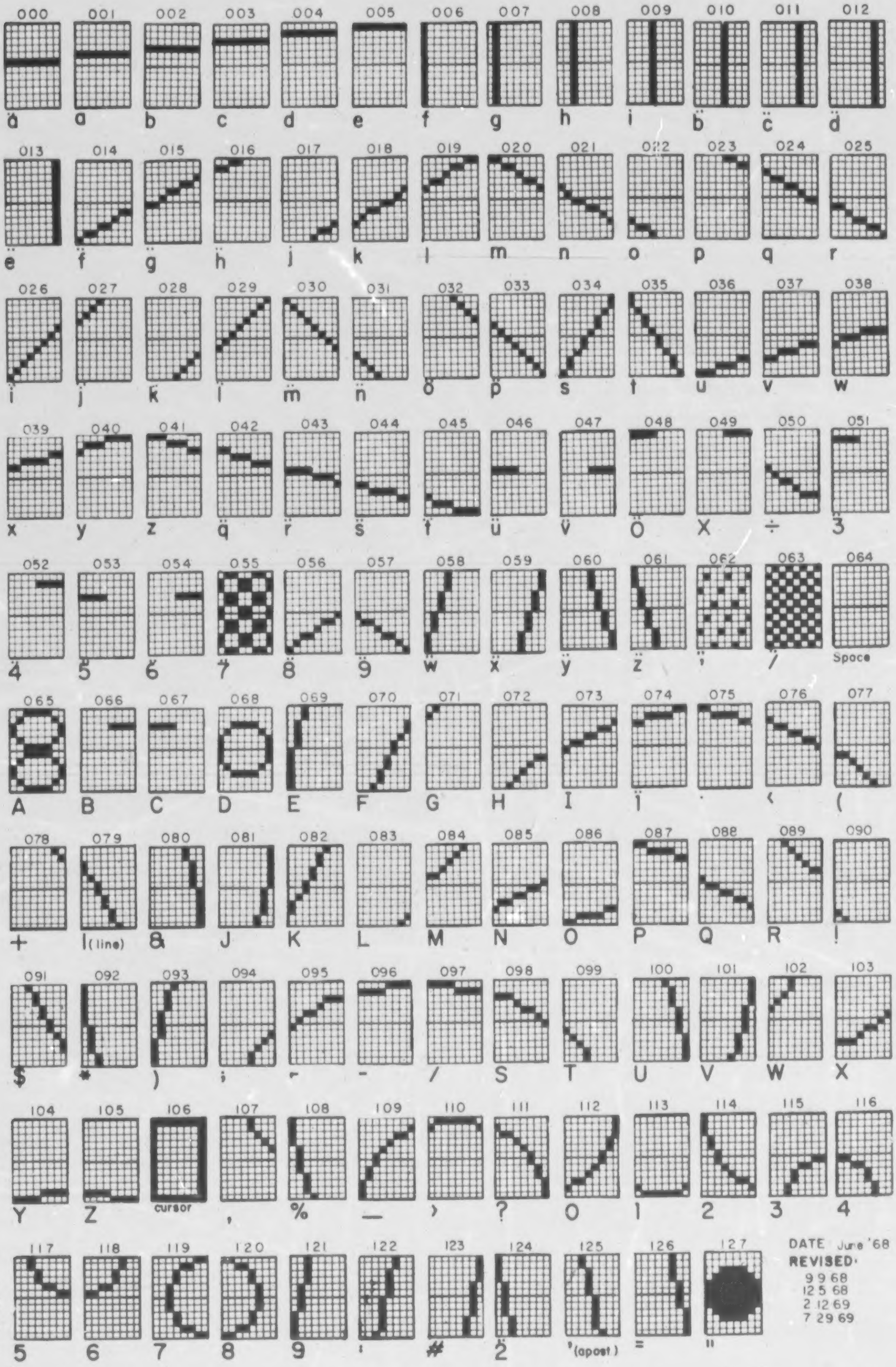
DICTIONARY NAME: MATH-SCIENCE
AUTHOR: Peloquin, Bloom

DATE: 8/68
REVISED:
8/28/68
9/6/68
9/17/68
1/10/69
3/10/69
10/29/69

Figure 3.2. Math-science dictionary.

THE PENNSYLVANIA STATE UNIVERSITY
COMPUTER ASSISTED INSTRUCTION LABORATORY

DICTIONARY NAME: GEOMETRIC
AUTHOR: PELOQUIN, BLOOM



DATE June '68
REVISED:
9 9 68
12 5 68
2 12 69
7 29 69

REFERENCE SHEET FOR STRAIGHT LINE SEGMENTS

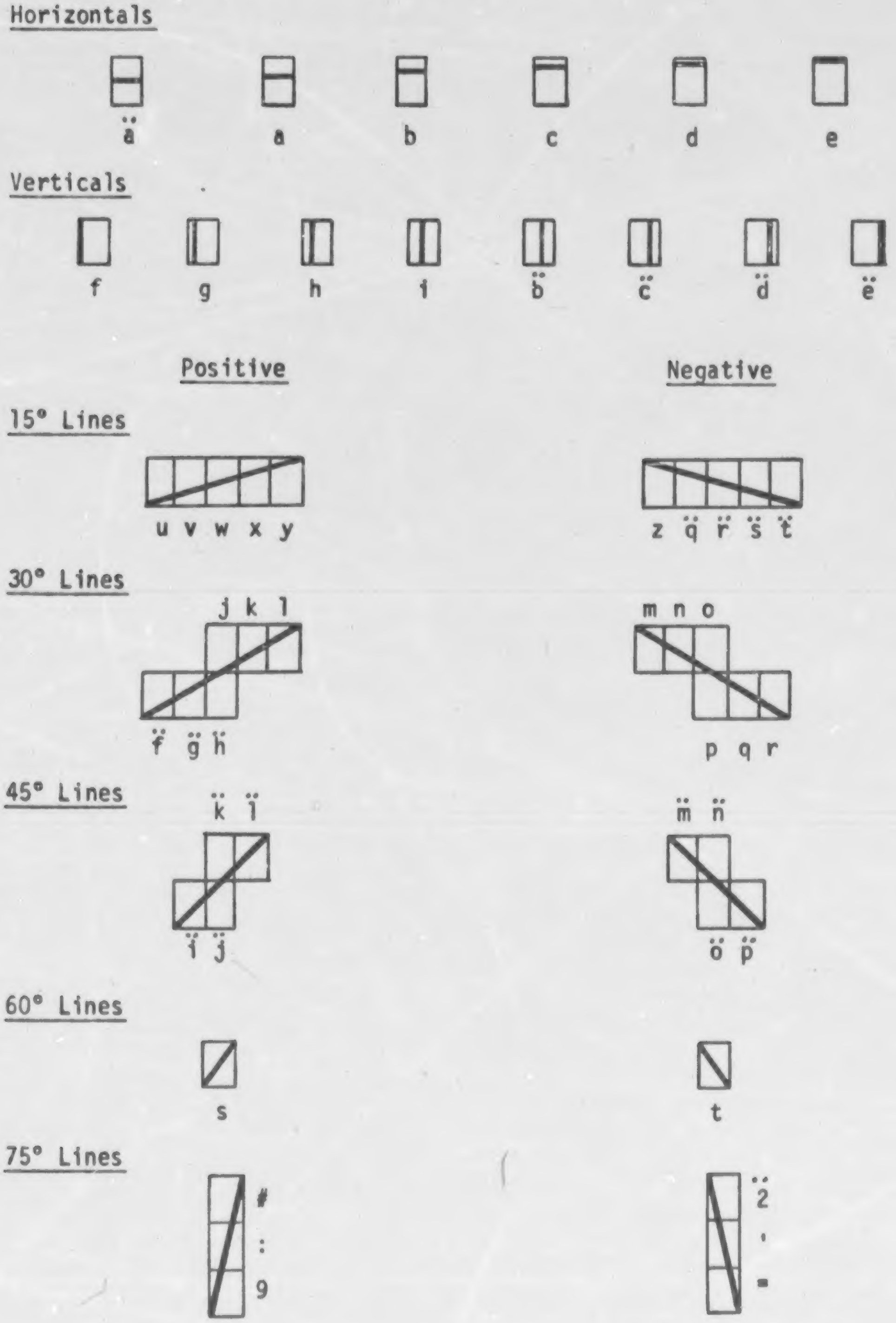
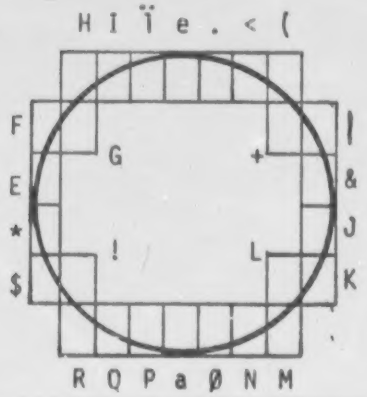


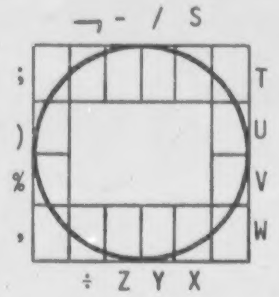
Figure 3.4. References for straight line segments.

REFERENCE SHEET FOR CURVED LINE SEGMENTS

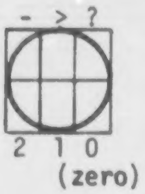
6 Characters Tall



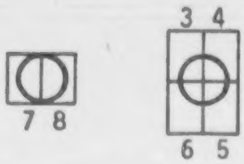
4 Characters Tall



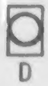
2 Characters



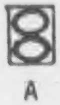
1 Character



1/2 Character



1 Row Tall



(2 in one Character)

THE PENNSYLVANIA STATE UNIVERSITY
COMPUTER ASSISTED INSTRUCTION LABORATORY

DICTIONARY NAME: DOTDI
AUTHOR: Bloom

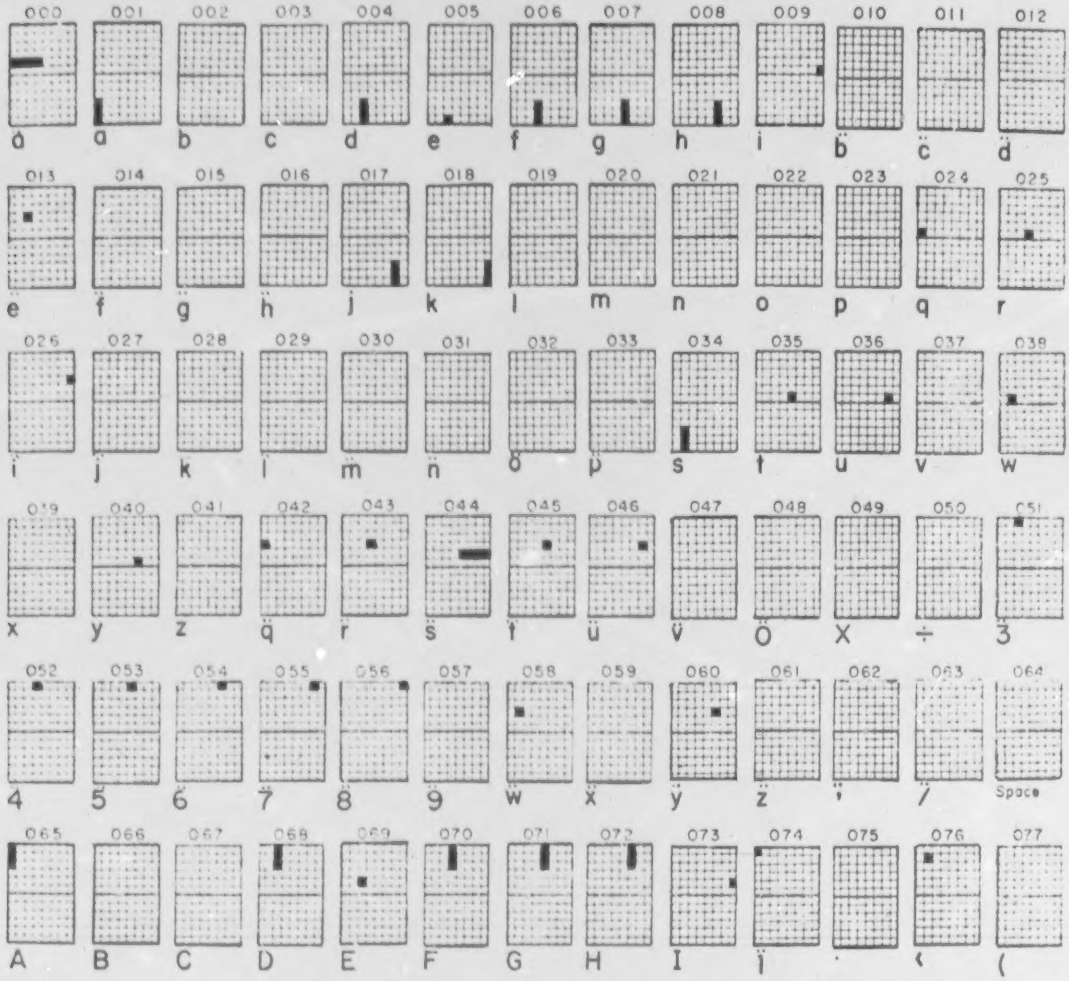


Figure 3.6. The dot dictionary.

Authors may request that special dictionaries be created to meet specific needs. However, some research should first be carried out to determine if an already-developed dictionary will serve the purpose.

Note: When constructing lines of text to be placed on the CRT, care should be taken to insure that an alternate-coded slash (character number 063 in each dictionary) is not the last character in the line. The 1500 Instructional System is programmed to interpret a final, alternate-coded slash as a control character rather than a text character. However, this problem may be solved by placing a backspace after the terminal alternate coded slash, making the backspace the final character.

Control of Images

The IBM 1512 image projector seeks at 40 frames per second. A 100 frame search for an image results in a pause of 2.5 seconds while the image projector locates the image. This 2.5 second pause is very noticeable by the students since all activity stops at the station during the search. A TACL instruction permits one to position an image prior to showing the image.

FORMAT: POSITION IMAGE nnn

Image number nnn will be positioned in the projector, ready to show when a SHOW IMAGE instruction is encountered.

The POSITION IMAGE instruction is performed while other activity at the student terminal continues. The POSITION IMAGE instruction is most frequently used when the author knows that the next image to be shown in located more than 100 frames away from the current image. The POSITION IMAGE instruction should then be used after the current image is no longer required. A POSITION IMAGE instruction may be substituted for a CLOSE IMAGE instruction if the current image will not also be the next image shown.

Control of Audio

When a PLAY AUDIO nnn instruction is encountered, the IBM 1506 audio unit must first search for the audio message before it can play the audio message. The audio unit needs 2 minutes and 40 seconds to find an audio message one-half way through the tape. As with the image projector, all activity stops at the student station while the audio unit searches for a message to be played.

FORMAT: POSITION AUDIO nnn

This instruction causes the audio unit to search for audio message nnn where nnn is a number between 1 and 999. The audio message will not be played until a PLAY AUDIO instruction is executed. Other activity at the student station may continue while the audio unit is positioning an audio message. The POSITION AUDIO instruction should be used when the author is certain of the next audio message to be played and when one is sure that the last played audio message will no longer be needed.

Analyzing Student Keyboard Responses

After a student types and enters his response and before the computer compares the student's response with the list of possible answers, the response is scanned and some special characters are removed from his answer. The following characters are normally removed from the student's response:

	space
.	period
,	comma
!	exclamation mark
-	hyphen
:	colon
;	semicolon
?	question mark
/	slash
	reverse index
	index
	carriage return
	backspace

The student's response is also changed to eliminate capital letters. All capital letters are replaced by lower case letters. Therefore, when evaluating a student's response it is not necessary to test the student's response to determine if the special characters are present.

Example: If the student types: Yes, or YES, or YES? of YES! or Y E S or yes or YES!!!! the response would be evaluated as yes and the statement IF (yes) GO TO aaa would match any of the above alternatives.

However, the automatic editing features of TACL can be modified to meet specific needs.

FORMAT: **EDIT**: $c_1c_2c_3$. . .

where $c_1c_2c_3$ -- are the characters to be eliminated from the student's response before it is evaluated using IF statements. When the EDIT instruction is used the student's answer is edited according to the characters contained in the EDIT instruction except that capital letters are always replaced with lower case.

Note: When an IF (CLASS. . .) GO TO aaaa statement is used the following characters are ignored in the student's response regardless of the characters contained in the EDIT instruction:

[illegible]	space
[illegible]	colon
[illegible]	semi colon
!	exclamation mark
?	question mark

Therefore, the above characters will always be removed from the student's response when an IF (CLASS) statement is used.

Strings of characters or words may also be [illegible] out of a student's response.

FORMAT: **EDIT**: <**String**>$_1$ <[illegible]>$_2$ . . .

Example: TO remove the words "and" and "the" from a student's answer the following instruction would be used: EDIT: < AND > <THE>.

Note: Because the less than (<) and greater than (>) symbols are used to define words in an EDIT instruction, the following format must be used to edit out < and >:

To edit out <use:<<>

To edit out >use:<>>

Note: A special code is also needed to edit spaces and semicolons from a student's answer.

TO edit out b (space) use a | |(cursor) in place of a space.

TO edit out ; (semicolon) use |/| (alternate coded slash, in place of a semicolon.)

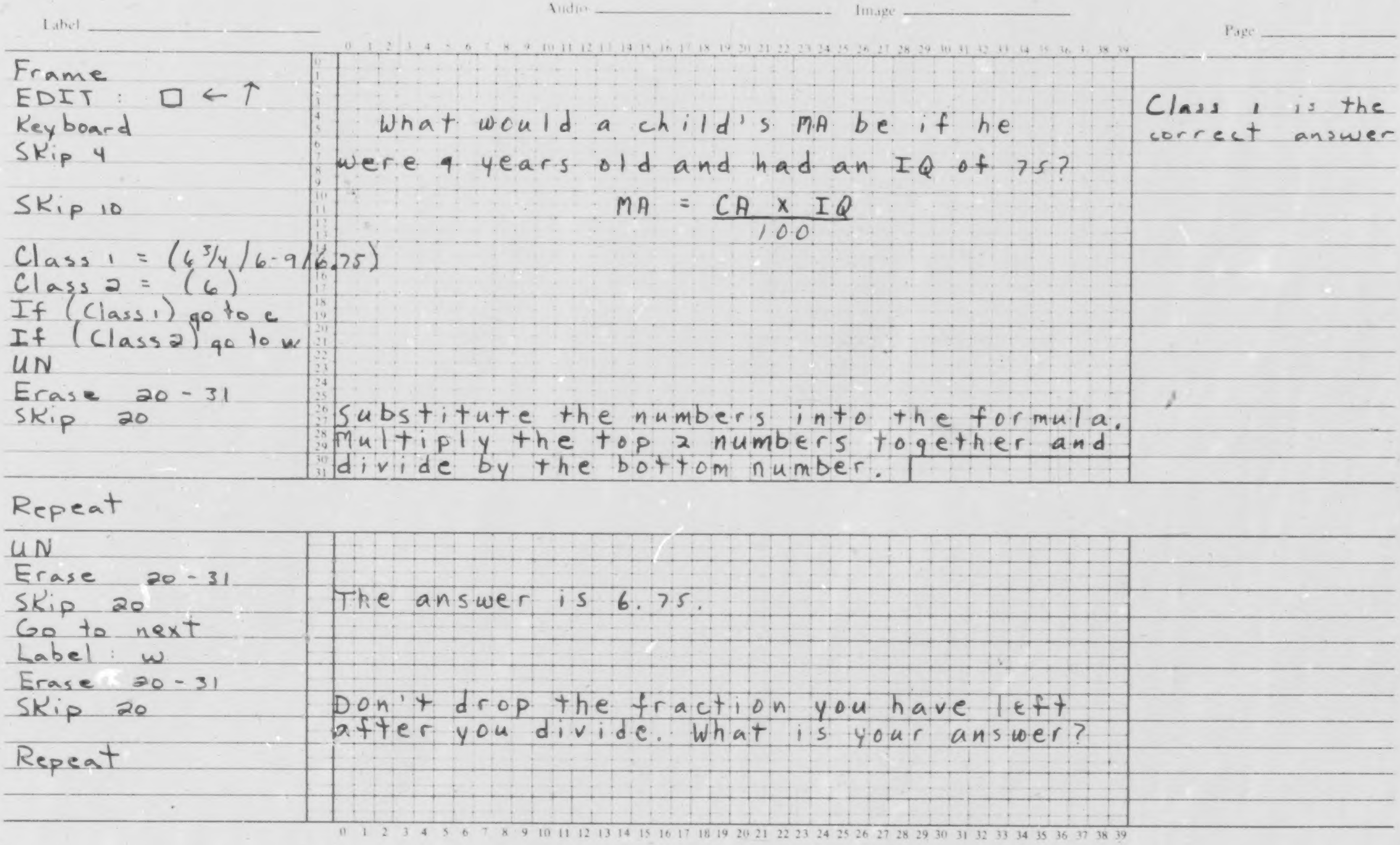
After an EDIT instruction is used in a chapter, **each** succeeding student response will be edited according to the characters specified in the EDIT instruction. However, the author may return the EDIT function to its original state.

FORMAT: **EDIT:**

Any special editing will be terminated by this instruction and the normal editing (deletion of spaces, periods, commas, exclamation points, hyphens, colons, semicolons, question marks, slashes, reverse indexes, indexes, carriage returns, and backspaces) will again be removed from the student's answer.

Example: The frame shown in Figures 3.7 and 3.8 (and flowcharted in Figure 3.9)requires a numerical answer which contains a decimal (6.75) or an answer which contains a hyphen (6-9 or 6 years - 9 months). Since the normal edit would remove both the period and hyphen, an EDIT: | |instruction was used to modify the EDIT instruction so that **only** spaces, indexes and backspaces will be removed from the student's response. The slash, period and hyphen will not be removed. Note however, that since an IF (CLASS, .. .) GO TO aaaa statement is used. The comma, exclamation mark and question mark will still be removed.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory

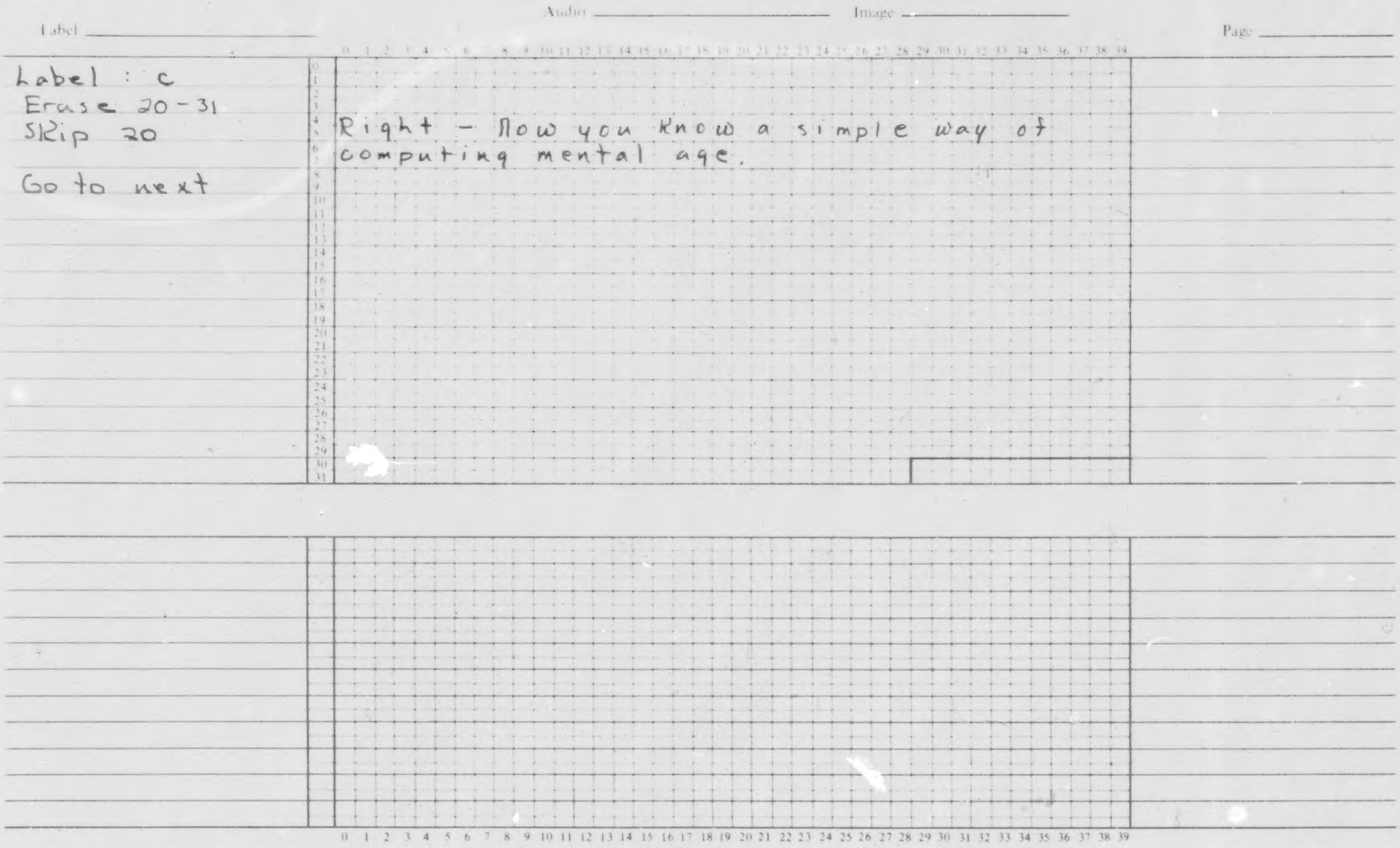


Label ______ Audio ______ Image ______ Page ______

Frame		
EDIT : □ ← ↑		Class 1 is the correct answer
Keyboard	What would a child's MA be if he	
Skip 4	were 9 years old and had an IQ of 75?	
Skip 10	$MA = \frac{CA \times IQ}{100}$	
Class 1 = (6 3/4 / 6-9/6.75)		
Class 2 = (6)		
If (Class 1) go to c		
If (Class 2) go to w		
UN		
Erase 20 - 31		
Skip 20	Substitute the numbers into the formula. Multiply the top 2 numbers together and divide by the bottom number.	
Repeat		
UN		
Erase 20 - 31		
Skip 20	The answer is 6.75.	
Go to next		
Label : w		
Erase 20 - 31		
Skip 20	Don't drop the fraction you have left after you divide. What is your answer?	
Repeat		

Figure 3.7. Sample EDIT instruction.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label ______ Audio ______ Image ______ Page ______

Label : c
Erase 20 - 31
Skip 20

Go to next

Right – Now you know a simple way of
computing mental age.

Figure 3.8. Continuation of figure 3.7.

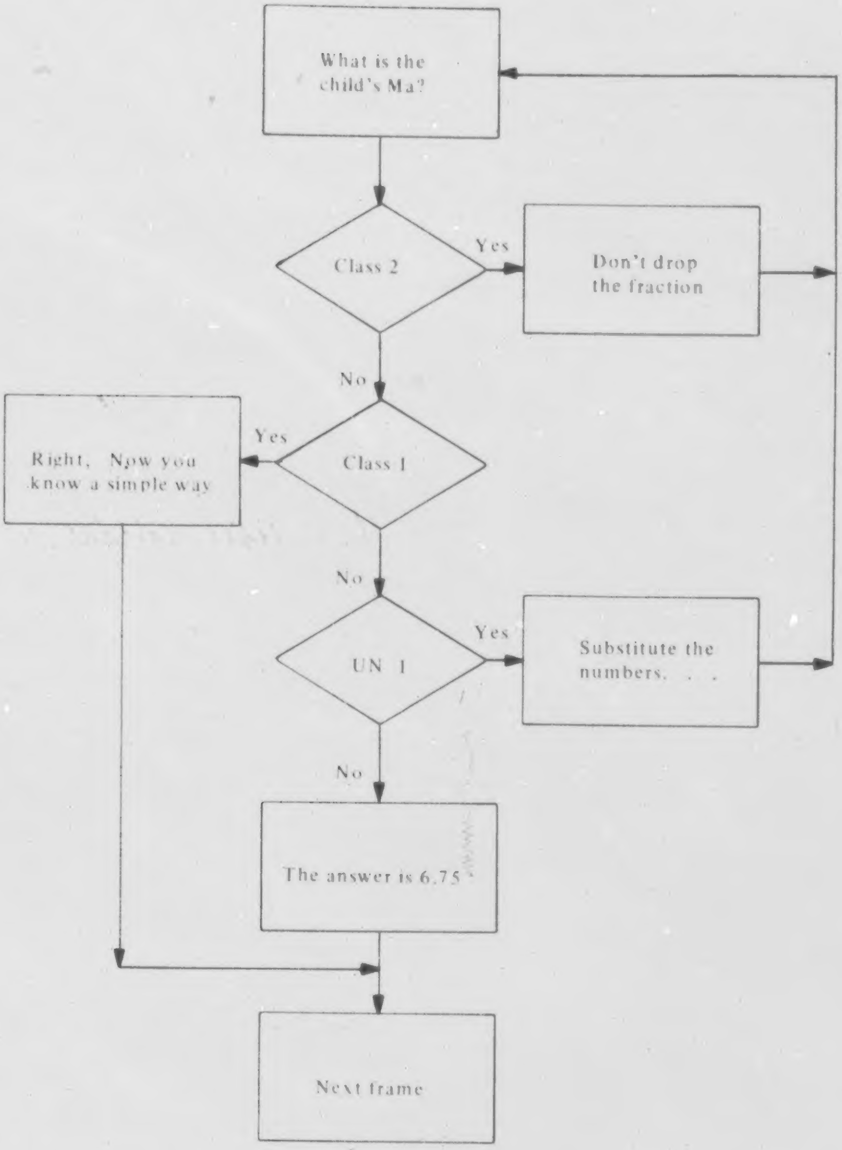


Figure 3.9. Flowchart of instructional strategy shown in figures 3.7 and 3.8.

Identifying Student Responses

The IBM 1500 Instructional System is capable of producing a permanent record of every student's response to every question contained in a course. The CAI Laboratory at Penn State has a series of data reduction computer programs which are used to summarize the students' responses for the purpose of course evaluation. TACL places a unique identifier consisting of up to 10 characters on each question in the chapter that requires a response from a student and a unique two character identifier on each of the possible response alternatives which are stored within the chapter. The question identifier and the response identifier are keyed to the frame number so that the author may readily correlate the students' response with a particular frame in the chapter.

The question identifier consists of up to ten characters. The frame label consisting of a two-letter segment identifier and a two-digit number between 00 and 99 occupies the 2d, 3rd, 4th, and 5th, positions of the question identifier. If the request for a student response was made after a **LABEL:** a instruction, the label (a) would be placed in the 6th position of the question identifier.

The 7th position contains a letter from **A-Z** which is used to identify the ordinal position within the frame, i.e. the first question would contain **A**, the second question would contain **B**, etc. in the 7th position.

Example: Figure 3.10 shows a hypothetical example. For the purpose of illustration, assume that Figure 3.10 is the 89th frame of the chapter **AB**. The first question in the frame is identified with bAB89bAbbb. The **AB89** in positions 2-5 is the frame label. The **A** in position 7 signifies that this question is the first question in the frame.

The second question in the frame located under **LABEL: N** has a question identifier of bAB89NBbbb. The **AB89** in positions 2-5 is the frame label. The **N** in position 6 signifies that the question is located under the **LABEL: N** instruction. The **B** in position 7 indicates that this is the second question in the frame.

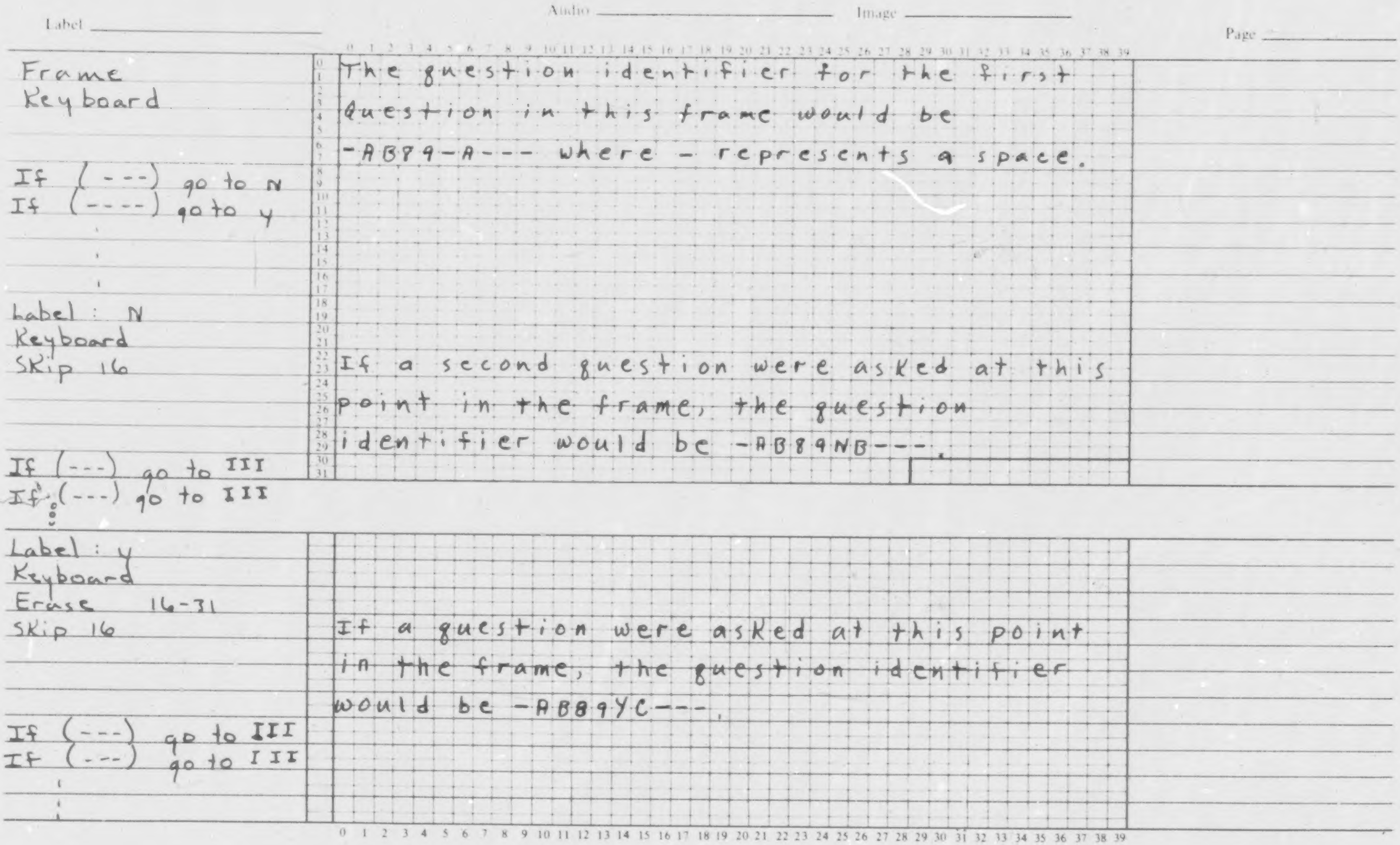
The third question in the frame located under **LABEL:** y would have a question identifier of bAB89ycbbb. As in the other question identifier the **AB89** in positions 2-5 is the frame label. The y in position 6 indicates that the question is located under **LABEL:** y and the c in position 7 indicates that the question is the third question in the frame.

Note: The character in position 7 indicates the number of the question in the frame, not the order in which the student answered the questions.

Note: The question identifier will always be the same each time a student answers a question. The question identifier does not reflect the order in which a student answers the question or the number of students who answered the question.

Should the author desire to further code a question identifier, the four unused positions of the question identifier (positions, 1, 8, 9 and 10) may be set by means of the following TACL instruction.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label ______ Audio ______ Image ______ Page ______

Frame
Keyboard

The question identifier for the first
question in this frame would be
-AB89-A--- where - represents a space.

If (---) go to N
If (----) go to y
:

Label : N
Keyboard
Skip 16

If a second question were asked at this
point in the frame, the question
identifier would be -AB89NB---.

If (---) go to III
If (---) go to III
:

Label : y
Keyboard
Erase 16-31
Skip 16

If a question were asked at this point
in the frame, the question identifier
would be -AB89YC---.

If (---) go to III
If (---) go to III
:

Figure 3.10. Sample of response identification (1).

FORMAT: **IDENT:** $c_1 . . . c_4$

where c_1 to c_4 represent 2 to 4 characters which will be placed in the question identifier. The first character will appear on the first position of the question identifier. The second, third and fourth characters will appear in positions 8, 9 and 10 of the question identifier.

Note: The first character c_1 will appear to the right of the frame label in the lower, right-hand corner of the CRT. This is useful for identifying when a student is executing special segments of code.

After the IDENT: $c_1 . . . c_4$ is used, it continually modifies the question identifier of each question. To terminate the modification of the question identifiers, the following instruction is necessary.

FORMAT: **IDENT:**

The IDENT: instruction terminates any special modifications that had been specified by the IDENT $c_1 . . . c_4$ instruction.

Identifying Alternate Responses

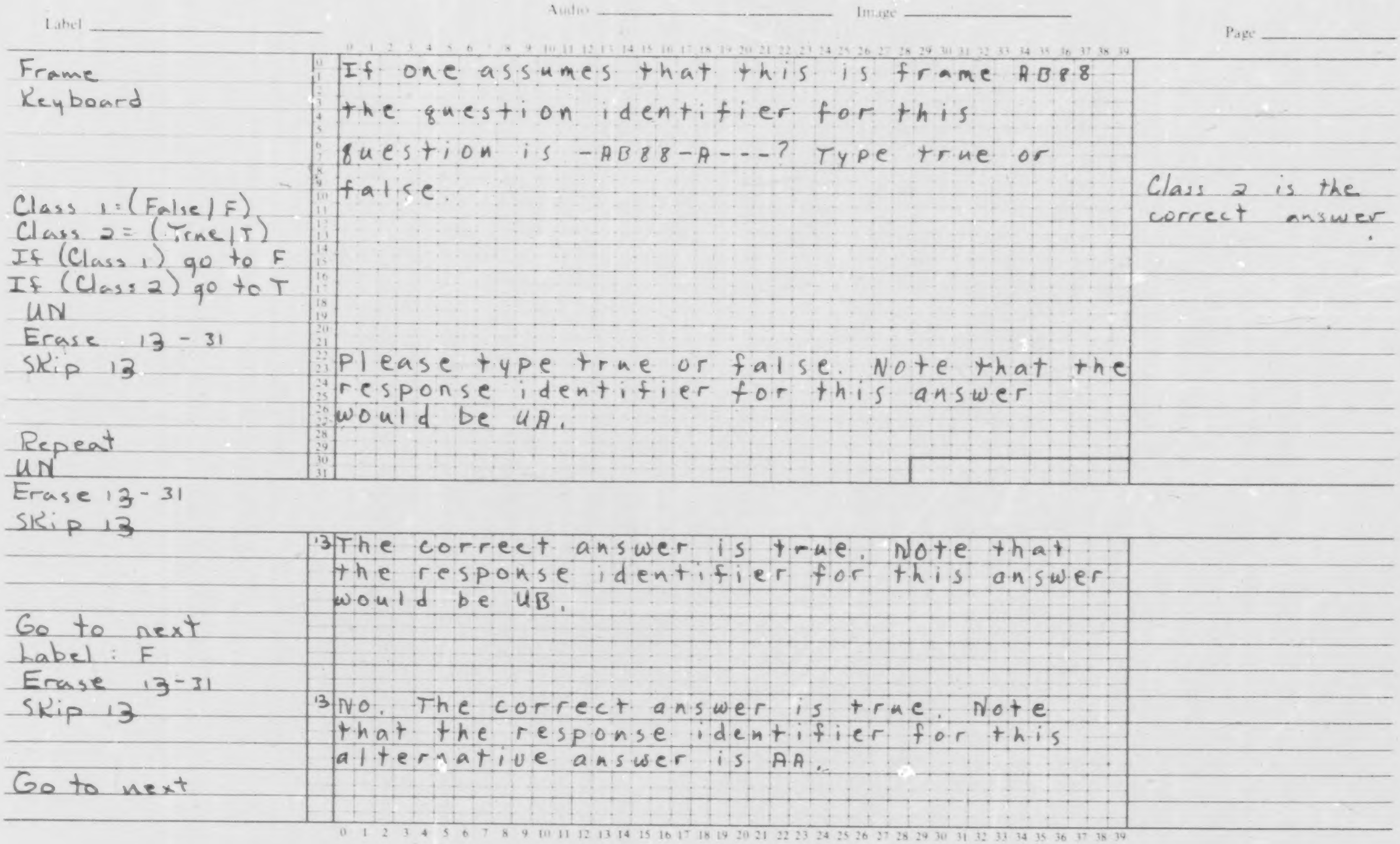
The IBM 1500 Instructional System is capable of identifying a specific response alternative that the student's response matched in addition to the question identifier. Both the question identifier and the response identifier may be permanently recorded for later analysis.

TACL creates a unique response identifier for every IF statement associated with a light pen or keyboard question within a frame. The first character of the response identifier is predefined as an A and the second character is predefined as an A and is incremented by one each time another IF statement is encountered.

Unanticipated responses (UN) also have response identifiers associated with them. The first character of the response identifier for a UN statement is a U and the second character is predefined as an A and is incremented by one each time another UN statement is encountered.

Example: See Figures 3.11 and 3.12. Figure 3.13 shows the instructional strategy shown in Figures 3.11 and 3.12. If the student matched CLASS 1 by typing FALSE, the computer would record that the student matched response AA to question bAB88bAbbb. Or, if the student matched the first UN statement, the computer would record that the student matched response AA to question bAB88bAbbb. Or, if the student matched the first UN statement, the computer would record that the student matched response AA to question bAB88bAbbb. Or, if the student matched the first UN statementhe computer would record that the student matched response UA to question bAB88bAbbb. By refering back to the TACL program, the author will be able to identify the specific alternative response that matched the student's response.

A TACL instruction allows the author to modify the first character of the response identifier to indicate additional information.



Label ______ Audio ______ Image ______ Page ______

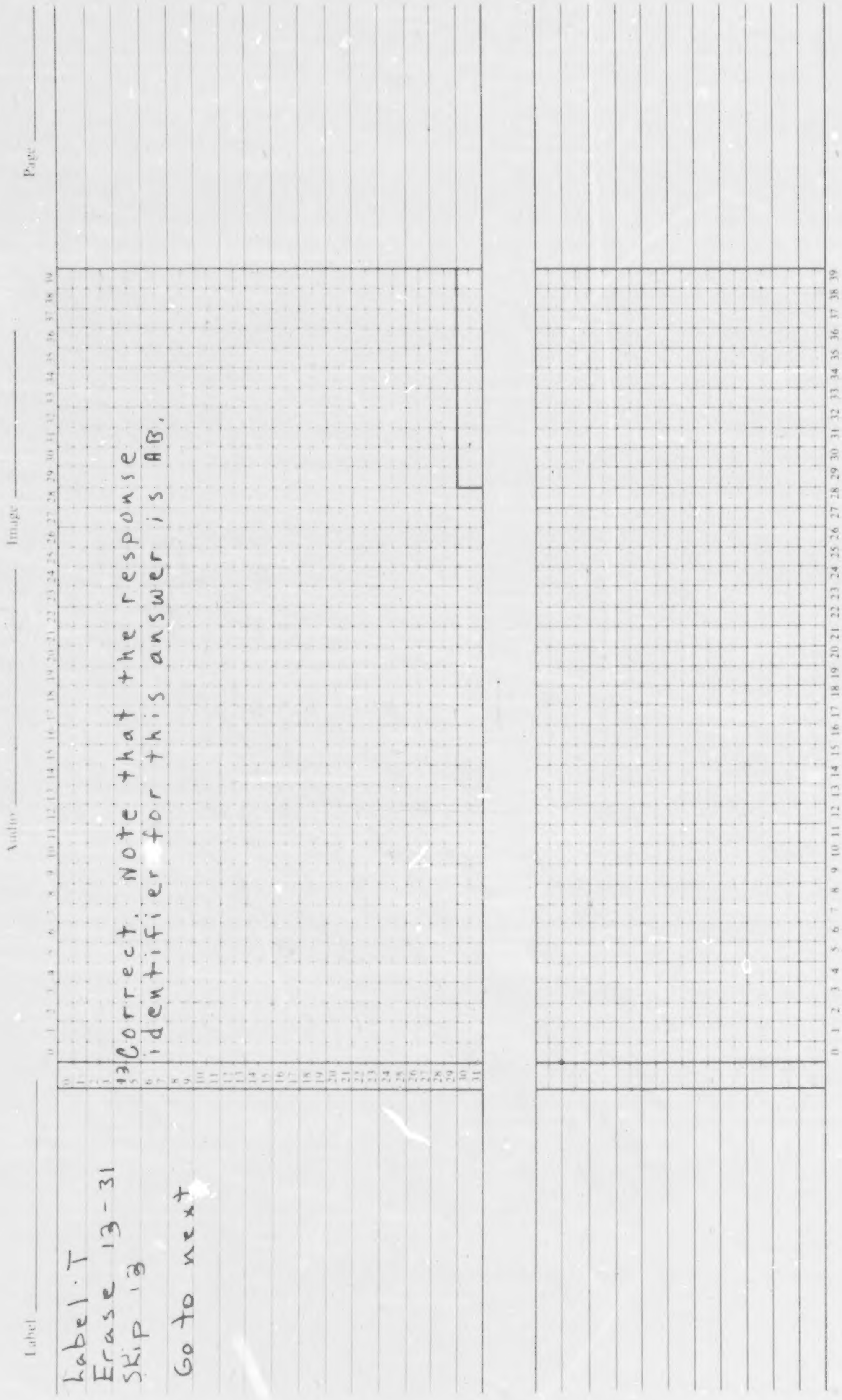
Frame Keyboard	If one assumes that this is frame AB88 the question identifier for this question is -AB88-A---? Type true or false.	

Class 1:(False/F)
Class 2=(True/T)
If (Class 1) go to F
If (Class 2) go to T
UN
Erase 13 - 31
Skip 13
		Class 2 is the correct answer.

	Please type true or false. Note that the response identifier for this answer would be UA.	
Repeat UN Erase 13 - 31 Skip 13		
	13 The correct answer is true. Note that the response identifier for this answer would be UB.	
Go to next Label : F Erase 13-31 Skip 13		
	13 No. The correct answer is true. Note that the response identifier for this alternative answer is AA.	
Go to next		

Figure 3.11. Sample of response identification (2).

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label
Audio
Image
Page

Label: T
Erase 13-31
Skip 13

Go to next

13 Correct. Note that the response
identifier for this answer is AB.

Figure 3.12. Continuation of figure 3.11.

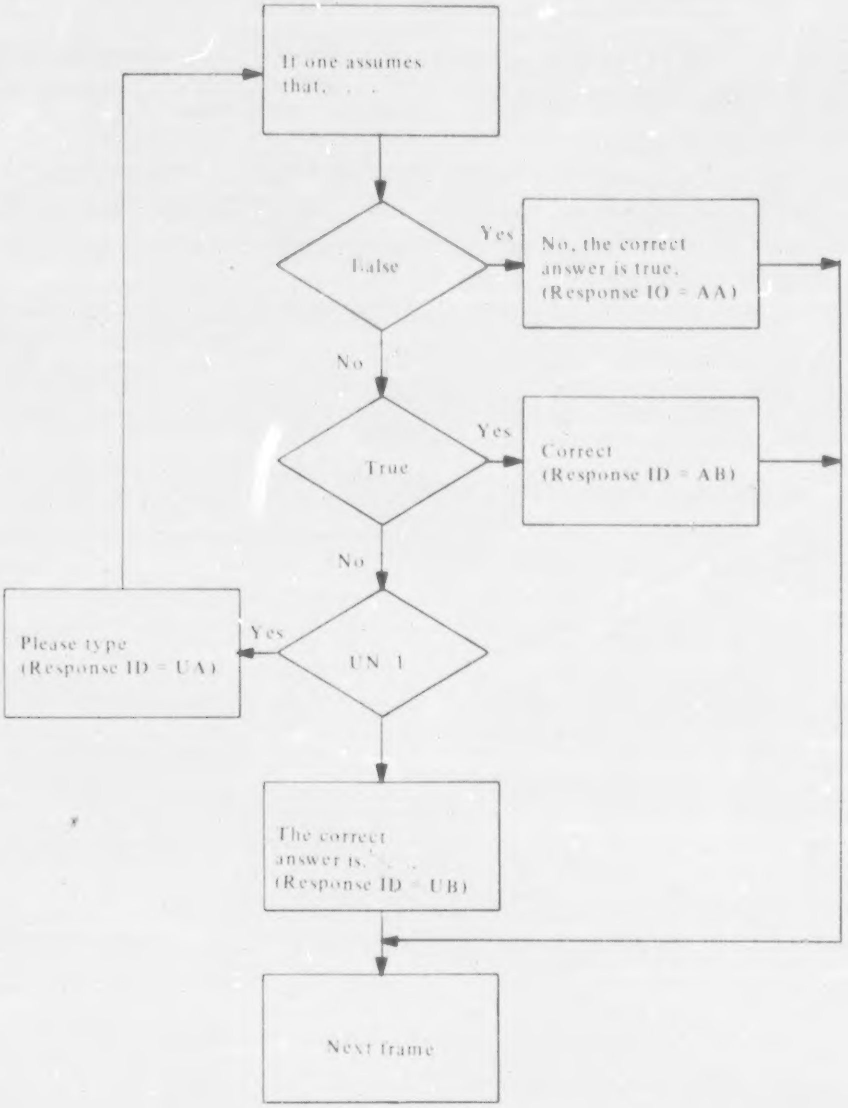

If one assumes that. . . .
False
Yes
No, the correct answer is true. (Response IO = AA)
No
True
Yes
Correct (Response ID = AB)
No
UN 1
Yes
Please type (Response ID = UA)
The correct answer is. . . . (Response ID = UB)
Next frame

Figure 3.13. Flowchart of instructional strategy shown in figures 3.11 and 3.12.

FORMAT: IDENT: c_1

The character c_1 will appear in the first position of the two character response identifier which follow it. A typical use of the IDENT: c_1 is to identify correct answers with a c and wrong answers with a w.

Example: See Figures 3.14 and 3.15. A flowchart of the instructional strategy is shown in Figure 3.16. The IDENT: w instruction preceding the IF ([FALSE])... statement will change the first character of the response identifier from an A to a W. The first character of the response identifier is again changed to C before the IF ([TRUE])... statement by the use of the IDENT; C instruction. The IDENT instruction used to modify IF statement does not modify the first character of the UN statements. To change the first character of an UN instruction, another IDENT: c_1 instruction must be used.

The author may reset the first character of the response identifier at any time.

FORMAT: IDENT:

Note: Care must be taken to either reset the first character of the response identifier to "a" by the use of an IDENT: instruction, or reset it to the desired character. The last definition will be used in succeeding frames i.e. all additional response identifiers will begin with a "C" unless some action is taken to revise the definition.

Score Keeping

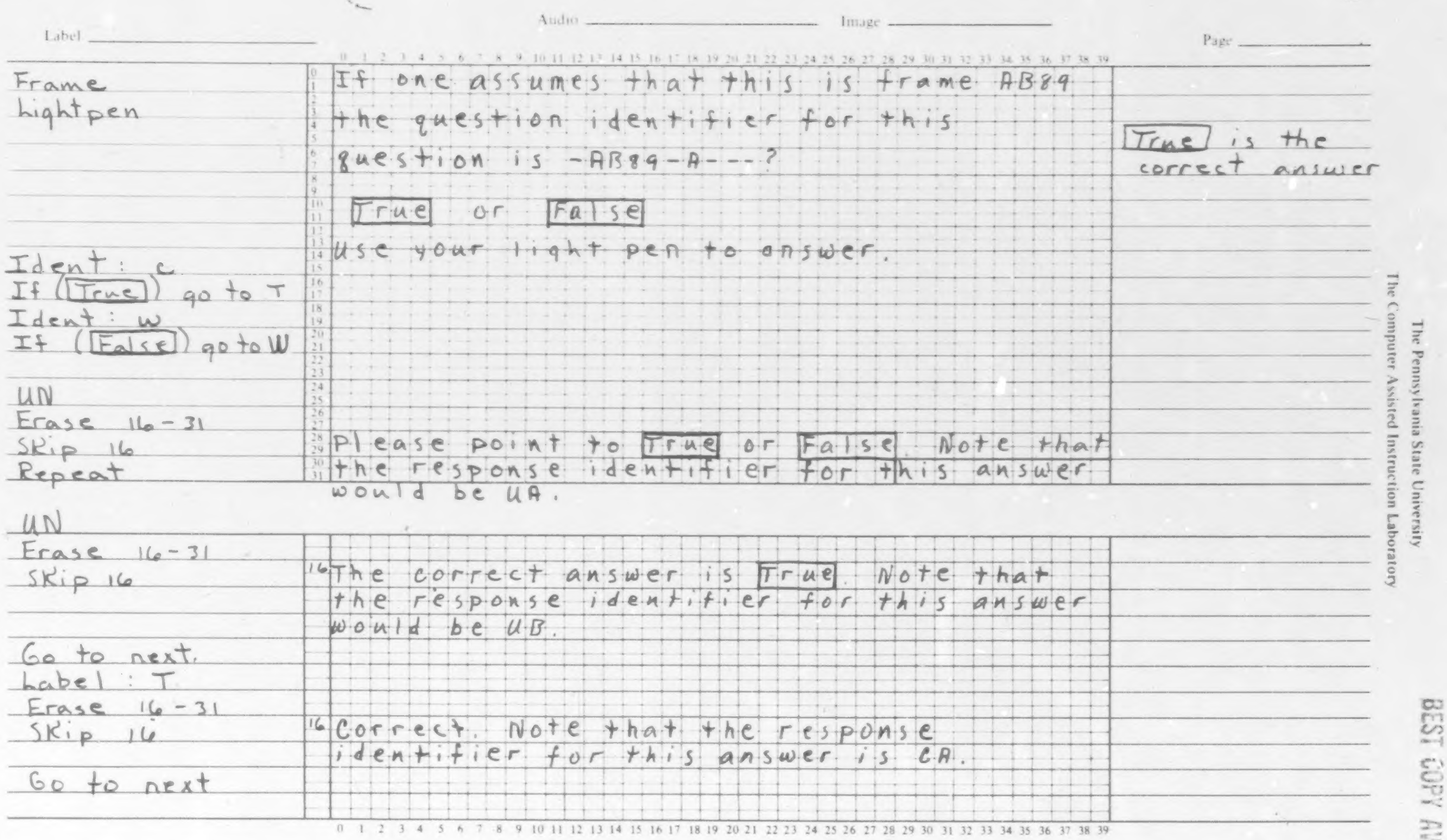
Many times data will have to be saved while a student progresses through many chapters of a course. TACL assigns counters to variable names in the order in which the names are encountered. Whenever possible, one should predefine the variable names that are anticipated by the course authors. Each of the variables should then be used in the same order in each chapter of the course.

Example: It has been determined that a pretest and three quizzes will be administered to the students during the course. The test scores must be available at the end of the course so that grades can be awarded. The variable names that will be used for the test scores are:

PRET	PRETEST
Q1	QUIZ 1
Q2	QUIZ 2
Q3	QUIZ 3

at the beginning of the first chapter of the course the variables should be initialized:

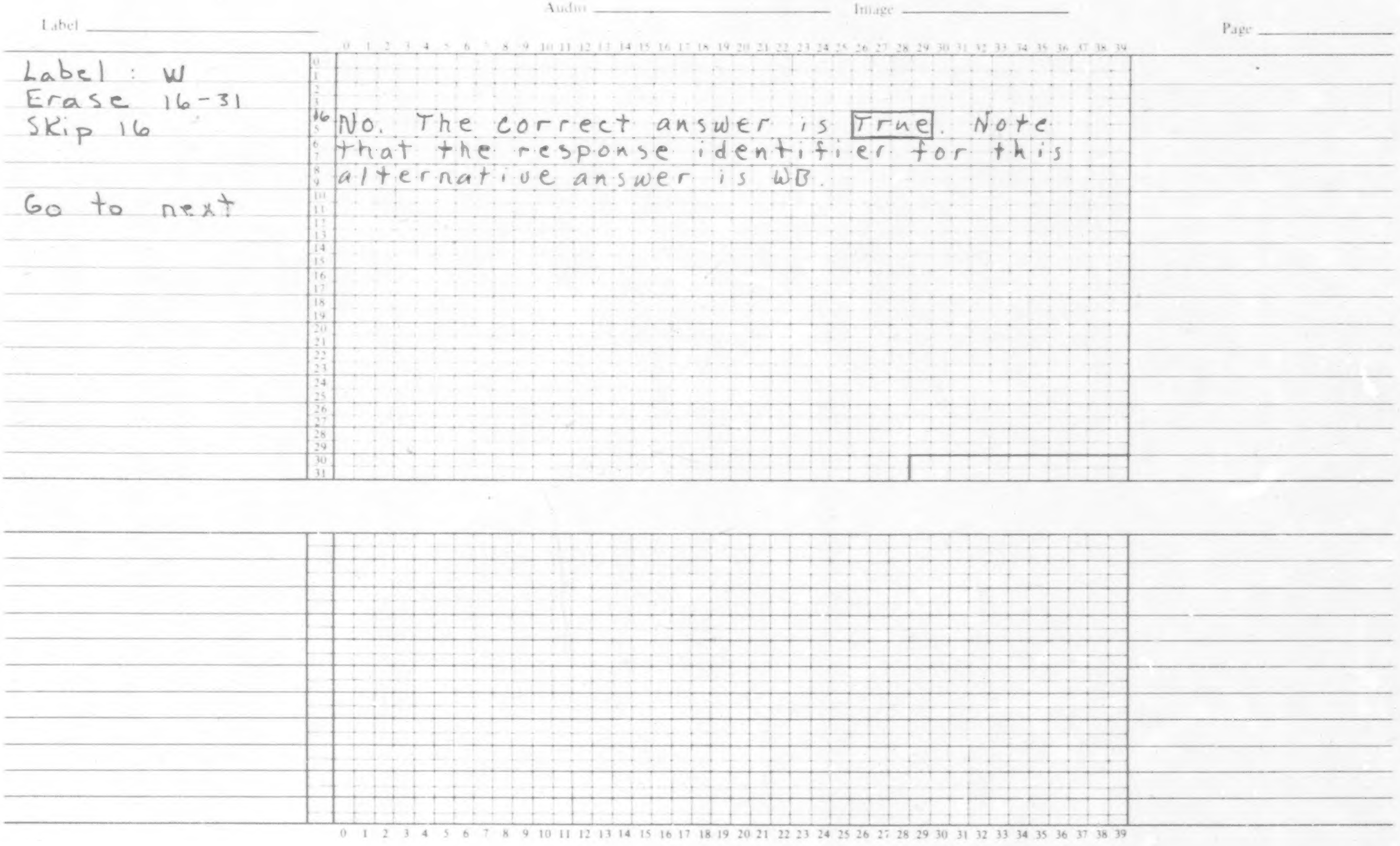
PRET = 0
Q1 = 0
Q2 = 0
Q3 = 0



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label	Audio / Image	Page
Frame	If one assumes that this is frame AB89	
Lightpen	the question identifier for this	True is the
	question is -AB89-A---?	correct answer
	True or False	
Ident: c	Use your light pen to answer.	
If (True) go to T		
Ident: w		
If (False) go to W		
UN		
Erase 16-31		
Skip 16	Please point to True or False. Note that	
Repeat	the response identifier for this answer	
	would be UA.	
UN		
Erase 16-31		
Skip 16	16 The correct answer is True. Note that	
	the response identifier for this answer	
	would be UB.	
Go to next.		
Label: T		
Erase 16-31		
Skip 16	16 Correct. Note that the response	
	identifier for this answer is CA.	
Go to next		

Figure 3.14. Sample of IDENT instruction.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Label : W
Erase 16-31
Skip 16

Go to next

16 No. The correct answer is True. Note
that the response identifier for this
alternative answer is WB.

Figure 3.15. Continuation of figure 3.14.

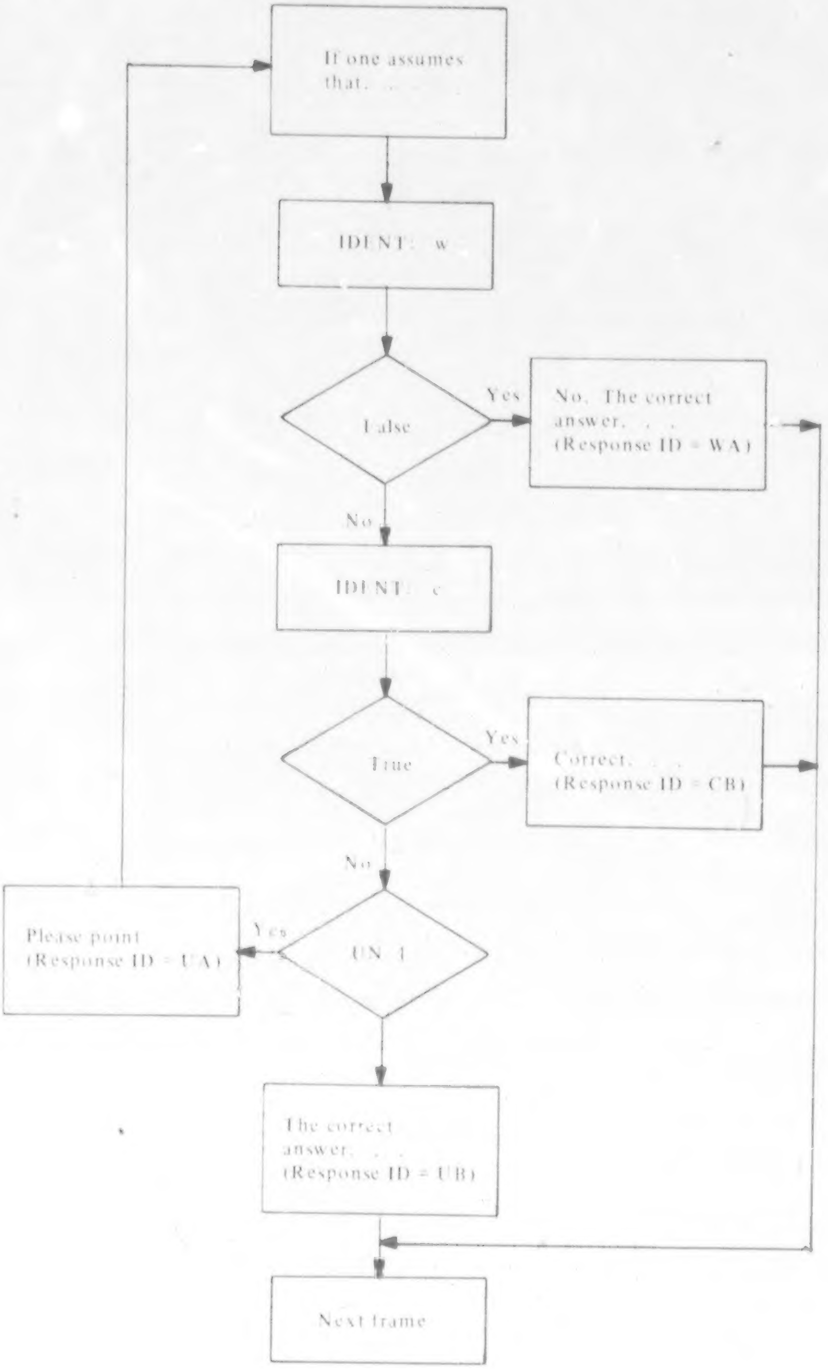

If one assumes that. . . .
IDENT: w
False
Yes
No. The correct answer. . . (Response ID = WA)
No
IDENT: c
True
Yes
Correct. . . (Response ID = CB)
No
UN: 1
Yes
Please point (Response ID = UA)
The correct answer. . . (Response ID = UB)
Next frame

Figure 3.16. Flowchart of instructional strategy shown in figures 3.14 and 3.15.

Then, at the beginning of every other chapter the following code should be inserted:

```
PRET = PRET
  Q1 = Q1
  Q2 = Q2
  Q3 = Q3
```

This code will insure that the four variables will always be assigned to the same counters, and that the data contained in the variables will remain the same throughout the course. Whenever possible predefine as many variables as possible and insert identical code in each chapter to insure that the counter assignments will not change.

Inserting Coursewriter II Code

A large number of the facilities of the Coursewriter II programming language have been implemented in TACL. TACL greatly simplifies the process of coursewriting; however, certain coding situations do exist where Coursewriter II is necessary. Coursewriter II code can be inserted in TACL by using the following instructions:

FORMAT: **CW**

The instruction specifies that the following instruction(s) is (are) Coursewriter II. Coursewriter II input is terminated by any TACL instruction. When writing Coursewriter II instructions, the format specified for the Coursewriter II instructions should be followed.

For an explanation of Coursewriter II's capabilities see:

IBM 1500 Coursewriter II, Author's Guide, IBM manual number Y26-1580-0.
Penn State Function Manual.

Note: When using a Coursewriter II branch statement, it should be noted that any TACL labels input with a LABEL: aaaa instruction are capitalized. This must be taken into account when branching to a label.

TACL Problems and Limitations

Class statements: Each CLASS statement may contain up to 99 characters, including delimiters, and no more than [illegible] logical operators.

Segment size: Approximately 10,000 TACL statements may be used in each chapter.

Coursewriter II: TACL uses buffer 1, buffer 5, switch 29, and switch 30 for answer processing.

UN: All feedback should end with a GO TO. . .or REPEAT instruction. If a GO TO statement is used with an UN statement, subsequent UN statements will not be executed.

Keyboard: The cursor will appear on the next available row if the cursor is not included in the text. To make the cursor appear in column zero of a line of text preceed it by a space followed by a backspace.

Frame *: The system may experience hardware malfunctions from time to time and automatically sign off a student. After the malfunction has been corrected and the student again signs on, he resumes the course at the last restart point (identified by an *). Care should be taken to use as many restart points as possible to avert unnecessary long reviews of material. Care must also be taken not to have a student restart at a point where he is not aware of what has gone before.

Light Pen: Although each alternate-coded answer in a frame must be unique it is possible to have the white blocks to which the students' point look the same. This is accomplished by typing the alternated coded character (|A|) followed by a backspace and the same non-alternate coded character. The non-alternate coded character fills in the non-white areas within the character and gives the appearance of a solid white block. When constructing the IF statement to analyze the response, only the contigious alternate coded characters need appear in the IF statement. If the author desires a 2-row by 2-column response area, one could program the response alternative to consist of an alternate-coded slash (a white block in the standard dictionary) followed by an alternated-coded character, backspace and non-alternate-coded character. The IF statement would then consist of alternate-coded slash, alternate coded character.

CHAPTER FOUR

INPUTTING TACL INSTRUCTIONS

The TACL instructions are entered into the computer in student mode via the 1500 Instructional System. Student mode input was chosen over author mode to allow simultaneous input and to increase the efficiency of the 1500 Instructional System. As the instructions are input at the 1510 CRT terminal they are written on magnetic tape and stored for later processing.

Inputting from the 1510 CRT has many advantages over other methods of inputting, especially card input methods. When using the CRT terminal all of the special characters may be typed without the use of special codes that are required by card input systems. The special characters which are contained in the system, math-science, graph and dot dictionaries, appear on the CRT as they are typed. The text programmed to appear on the CRT is in identical format when input and when appearing in the program. This feature aids in the formatting and spacing of text. Furthermore, the erase capabilities of the 1500 System allow one to easily correct errors before they enter the system.

Signing on to the Inputting Program

In order to input TACL instructions to the system one must sign on to a special course called AUTHOR. One signs on to AUTHOR in the following manner:

1) Get the computer's *attention* by holding down the alternate coding key and pressing the index key simultaneously. If this is done properly, a cursor (| |) should appear in the lower, left-hand corner of the CRT, and a K will appear in the lower, right-hand corner of the CRT.

2) Type: On, Author/ucce where ucce is a one-to-four-character user code which should be obtained from either the course coordinator or the system's operator.

3) Each time something is typed on the CRT it must be *entered* into the computer. The entering function is a means of signaling the computer that no more text will be typed and that what has been typed may now be processed.

The text "on author/ucce" must be entered into the computer. This is accomplished by holding down the alternate coding key and pressing the space bar. After this is done, both the cursor and the K in the lower, right-hand corner of the CRT should disappear and the message "you have been signed on" should appear on the CRT. If any other message appears on the CRT, make sure you typed what was intended and try again. If the same message reappears on the CRT, check with the course coordinator or the system's operator.

Chapter Identification

After you have been signed on to 'author', you will be asked to type the name of the course you will be working on. The course consists of up to five characters and is available from the course coordinator.

The course will then require you to type a two letter segment identifier. Each segment within a course must have a unique two letter identifier. The two letters form the basis of the frame label. After the two letter segment identifier is entered into the computer, the information you supplied will be redisplayed on the CRT and you will be asked if the above input is correct. Be sure the information is correct before typing yes. If any part of the information is incorrect, type no and you will be given a chance to reinput the information. If the number is incorrect, you will be required to sign off and then sign on again using the correct number.

After you are sure the course name, segment ID and number are correct and you typed yes, the CRT will be erased and the cursor will appear in column 0 of the first line. At this point you may begin typing the TACL instructions.

Inputting TACL Instruction

Each TACL instruction, or line of instructions, must be preceeded by a cursor. While inputting, a cursor may be typed by holding down the alternate coding key and pressing the ; (semi colon) key. Since the cursor does not preceed each TACL instruction on the coding sheets, care must be taken while inputting to precede each TACL instruction or line of instruction with a cursor. If a TACL instruction is not preceded by a cursor, the statement will be considered as a line of text (see Inputting Text) and the TACL instruction(s) will appear on the CRT.

It is not necessary for each TACL instruction to occupy a single line on the CRT. A line of TACL instructions may be typed together by separating each instruction with a ; (semi colon). When a line of TACL instructions is typed, only one cursor need be used and the cursor must be the first character of the line. An additional line may be used by typing two carriage returns at the end of the first line.

Note: The following TACL instructions should not be embedded within a line of instructions. The following TACL instructions should each occupy a separate line:

INSERT	(see page 97)
DELETE	(see page 114)
MOVE	(see page 115)
COPY	(see page 115)
REPLACE	(see page 114)
CLEAR	(see page 103)
CANCEL	(see page 99)
FRAME	(see page 97)

Note: When inputting TACL instructions it is *not* necessary to type spaces within the instruction. The course "author" automatically removes all spaces from the TACL instruction as they are entered. By not typing the spaces within the instruction, a greater number of instructions can be typed on one line.

Example: The following instructions could all be typed on one line of the CRT.

```
GO TO NEXT
LABEL: B
ERASE 21-31
SKIP 22
```

The instructional sequence listed above could be input as follows: | | GOTONEXT:LABEL:B:ERASE21-31:SKIP22.

Beginning a New Chapter

When inputting TACL instructions for the first time in a new chapter, the following instruction must be typed before typing the instructions on the coding sheets:

FORMAT: | | INSERT 1

The INSERT instruction tells the computer at which point to place the TACL instructions.

Note: The INSERT 1 instruction must be used when a new chapter (segment is started. *The INSERT 1 instruction may also be used when appropriate but must be used when beginning a new chapter (segment).*

Inputting The FRAME Instruction

The FRAME instruction or one of its correlaries (FRAME 2 or FRAME 3) should always be input as a single instruction rather than embedded in a line of instructions. Be sure to precede the FRAME instruction with a cursor and do not include an * (asterisk) when typing the instruction. After | | FRAME is typed and entered, you will be asked the question: "Is this a restart point? (yes or no)." If an * (asterisk) appears after the FRAME instruction on the coding sheet, type yes. If an * (asterisk) does not appear on the coding sheet, type no. After you type yes or no the CRT screen will be erased and the cursor will be placed in column 0 of row 0.

Inputting Text

Text to be displayed on the CRT for students is typed at the CRT exactly as it is to appear in the program. A cursor is not used at the beginning of a line of text as it is when inputting TACL instructions. The first line of text which is input following the FRAME instruction is assumed to be in rows 0 and 1 unless a SKIP instruction is used. The number of TACL instructions which intervene between the FRAME instrucion and first line of text do not affect the position at which the first line of text is displayed.

Skipping Rows

When lines of text are not single spaced and when a SKIP instruction is not used, rows may be skipped by pressing the index key the required number of times to place the text at the desired location. Again it must be emphasized that the text will appear to the student in the same format as it appears on the CRT when input, except that the TACL instruction will not appear on the CRT.

Continuing Lines of Text

Up to 99 characters may be input at one time. When the text reaches the right hand side of the CRT, the carriage return key should be pressed twice to continue on the next line. However, care must be taken to insure that an additional line of text can be completed before the 99 character limit is reached.

Note: When underscoring a line consisting of 40 characters, remember that 40 characters will be required to backspace to the beginning of the line leaving only 20 additional characters for underlines. This problem can be solved by using a carriage return and a reverse index to return to the beginning of a line. The carriage return and reverse index save 38 characters which may be used to underscore the text.

Changing Dictionaries

"Author" contains the following dictionary assignments:

0 = SYSTEM dictionary
1 = Math-Science dictionary
2 = Graph dictionary
3 = Dot dictionary

To type characters from one of these dictionaries the following functions must be performed:

1) hold down the alternate coding key and press the = key.
2) type the number of the dictionary to be used. All text will then appear in the new dictionary.

lines which may be cancelled is dependent on the number of instructions which were entered since the last group of instructions were written on magnetic tape. After you type the number of lines you wish to cancel you may resume inputting from the cancelled line. If the number of lines which may be cancelled is less than the number of lines after the point when the error occurred, you will have to wait until after the chapter has been processed to correct the error.

Note: A distinction needs to be made between cancelling TACL instructions and cancelling text when two carriage returns have been used to continue a line. Two lines of text connected by two carriage returns is considered to be two separate lines just as if each line of text were input separately. However, two lines of TACL instructions connected by two carriage returns is only considered to be one line. When the computer displays the number of lines that may be cancelled it is referring to the number of lines of text which appear on the CRT and the number of lines of TACL instructions that begin with a cursor. A line of instructions not beginning with a cursor is not to be considered as a separate line. If one wishes to correct a TACL instruction which appears on a line not preceded by a cursor, one must replace all of the TACL instructions which appear after the cursor.

Note: When counting the number of lines which may be cancelled, do not count CLEAR or CANCEL instructions. The CLEAR and CANCEL instructions are for use by the "author" program and are not written on the magnetic tape for later processing.

When Finished Inputting

After all of the TACL instructions have been entered into the computer, it is necessary to signal the computer that all of the instructions have been entered. This is accomplished by holding down the alternate coding key and typing a "q", then entering. The computer will then display:

> "To continue with a 'new' course segment, press the space bar, otherwise, please sign off."

If one does not type an alternate code q when finished inputting, the possibility exists that up to 5 of the last instructions will not be included in the chapter.

To Sign Off

To sign off after the above message has been displayed on the CRT, hold down the alternate coding key and press the index key to get the computer's attention. After the cursor appears in the lower, left-hand corner of the CRT and the K appears in the lower, right-hand corner of the CRT, type "off" and enter. The computer should then erase the screen and display "you have been signed off."

Note: The dictionary change function must be used each time a new line of text is started. The dictionary change function may be used as often as necessary.

Note: Other dictionary assignments may be specified for a course. The characters that appear on the CRT are determined by the dictionaries associated with a particular course and not by the dictionaries associated with the course "author". Therefore, when the dictionary assignments for a course are different than the dictionary assignments of "author" the text which appears on the CRT may be meaningless in "author". However, after the TACL program is transferred to the final course, the text on the CRT will again be meaningful.

Cursor Placement

When inputting text it is often desirable to be able to position the cursor at the location where the text will appear in the program. The **SKIP** instruction serves this purpose as far as the actual course is concerned, but has no affect on the position of the text on the CRT during the input stage. The following instruction permits one to position the cursor on any desired row of the CRT.

FORMAT: CLEAR r

where r is any row between 0 and 30. The **CLEAR** instruction erases the entire CRT screen and places the cursor in rows r and r + 1.

Correcting Errors During Input

There are two ways of correcting errors while inputting. The first method is used when an error is detected *before* the line is entered. The second method is used *after* the line has been entered.

Erase. The erase function is used when an error has been identified before the complete line has been "entered" into the computer. To erase, hold down the alternate coding key and press the backspace key once for each character to be erased. After the error has been erased, continue typing from that point.

Cancel. The cancel instruction may be used to cancel text or instructions which have already been entered into the computer.

FORMAT: [ ] CANCEL

After the CANCEL instruction has been entered, the computer will display the number of lines which may be cancelled prior to the CANCEL instruction. The number of

Example: Figures 4.1 to 4.15 the interaction between the computer and the inputter when the TACL instructions shown in Figures 2.12, 2.13, 2.20, 2.21 and 2.12 were input. To sign on, the inputter held down the alternate coding key, pressed the index key, then typed: ON AUTHOR/Z1. The computer responded with the message "you have been signed on," then requested the information shown in Figure 4.1.

Throughout this example, an i is used to indicate that an index character was typed: CR is used to indicate carriage returns; and e is used to indicate the enter function. Figure 4.2 shows the first instructions which were input. Note that all of the TACL instructions are preceded by a [ ](cursor) and that the first instruction for the new segment is [ ]INSERT 1. The second instruction, [ ]FRAME, caused the program to inquire if the frame is to be a restart point. The inputter responded by typing "yes" after which the CRT screen was erased and the cursor reappeared in column zero of row 0 (Figure 4.3).

Figure 4.3 shows the first set of instructions which were input after the FRAME instruction. The text which appears in rows 2 and 3 of Figure 4.3 will appear in rows 0 and 1 of the program even though it appears in rows 2 and 3 when input since neither a SKIP instruction nor an index was used to position the text. Note the use of the index key in rows 8, 9, 14, 17 and 22 to modify the spacing of the text without the use of a SKIP instruction.

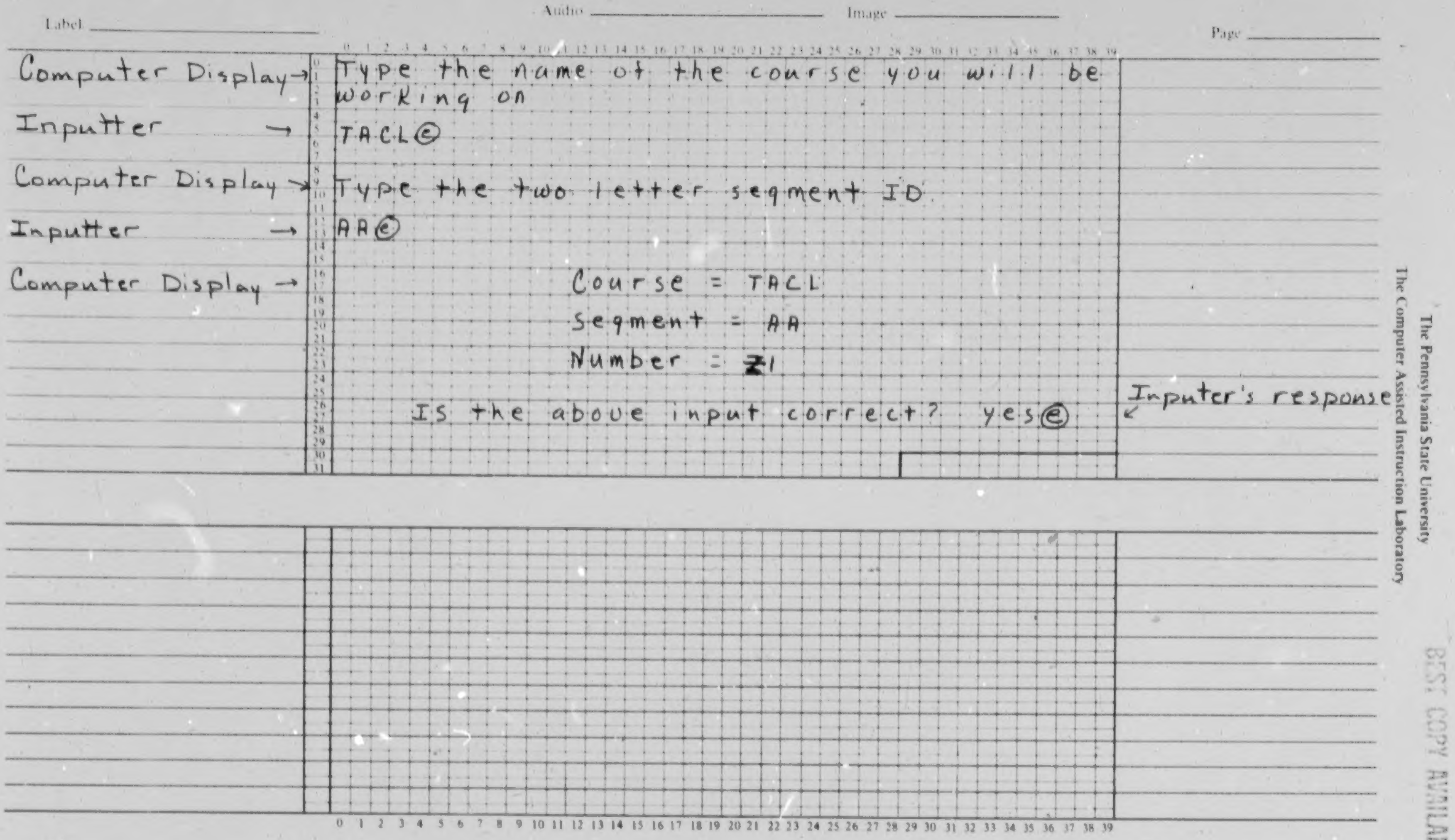
A comparison of the TACL instructions shown in rows 28-31 of Figure 4.3 with the TACL instructions shown in Figures 2.9 indicates that the ERASE 26-31 instruction is omitted from Figure 4.3. The inputter was not aware of the omission until after the text "touch your pen to a lighted box" had been input. Figure 4.4, rows 2 & 3 show the use of the CANCEL instruction. At that particular point only 2 lines prior to the CANCEL instruction could be cancelled. The line "touch your light pen to a lighted box" was cancelled and the last line of TACL instructions that were begun with a cursor.

The inputter then typed the new set of TACL instructions and re-input the text "touch your light pen to a lighted box."

Figure 4.5 shows another use of the CANCEL instruction. Note that the REPEAT instruction is mispelled in rows 12 and 13. The inputter noted the error after it had been entered but before any additional instructions or text had been input. One line preceding the CANCEL instruction was cancelled and the complete line of TACL instruction was retyped.

Figure 4.6 shows another example of the use of the FRAME instruction. After the inputter typed NO, the screen was erased and the cursor reappeared in column zero of row zero.

Figure 4.8 shows the use of the CLEAR instruction. The CLEAR instruction will not affect the formating of the text in the program. In this example, the inputter was aware that the text following the SKIP 14 instruction was to appear in row 14. The CLEAR 14 instruction erased the CRT screen and placed the cursor in rows 14 and 15 as shown in Figure 4.9. This use of the CLEAR instruction helped assure the inputter that the text would fit on the screen within a defined area. Figure 4.10 and 4.11 show other examples of the use of the CLEAR instructions.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

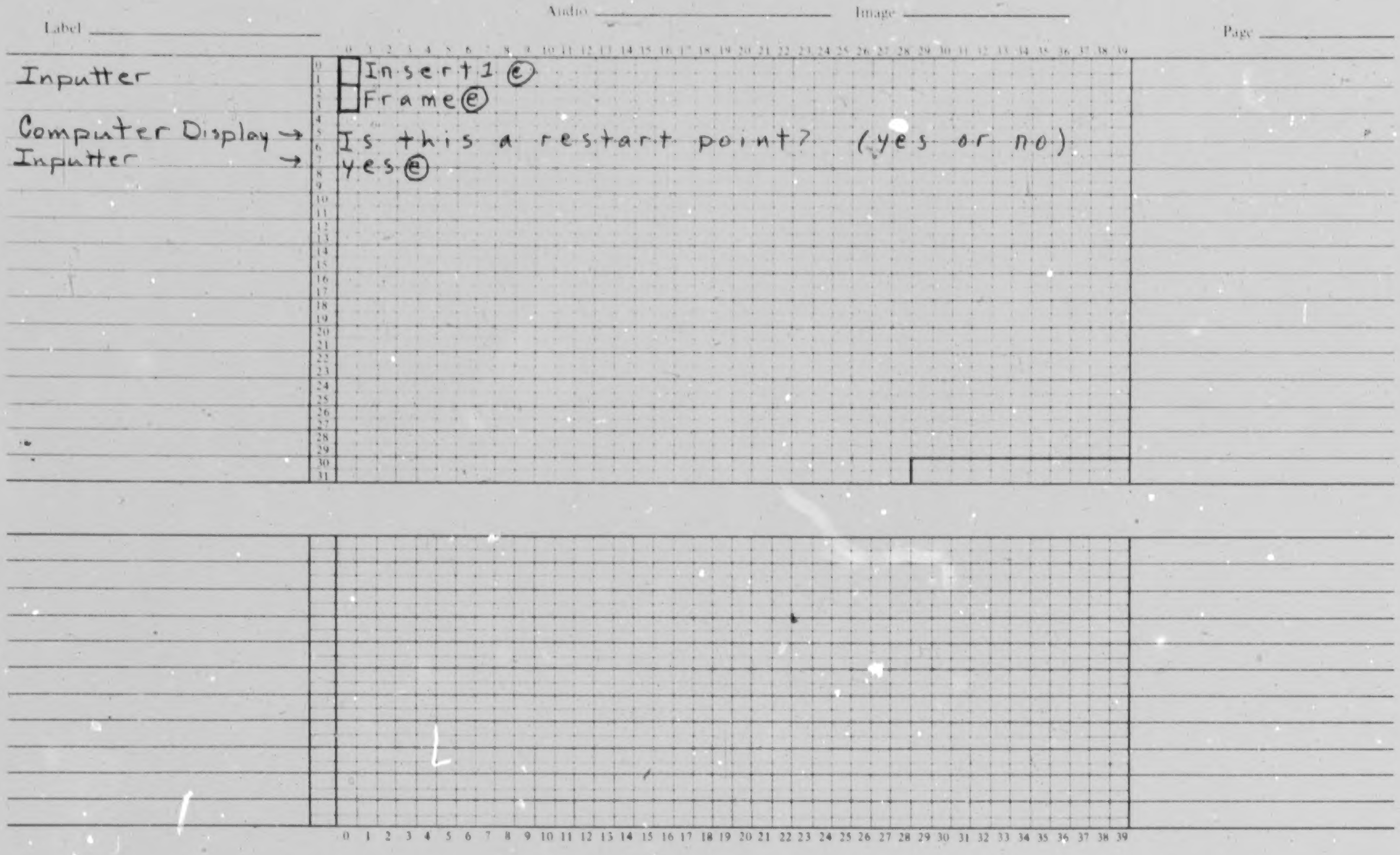
Label ______ Audio ______ Image ______ Page ______

Computer Display →	Type the name of the course you will be working on
Inputter →	TACLⓔ
Computer Display →	Type the two letter segment ID.
Inputter →	AAⓔ
Computer Display →	Course = TACL Segment = AA Number = 21 Is the above input correct? yesⓔ

↙ Inputer's response

Figure 4.1. Sample of inputting sequence (1).

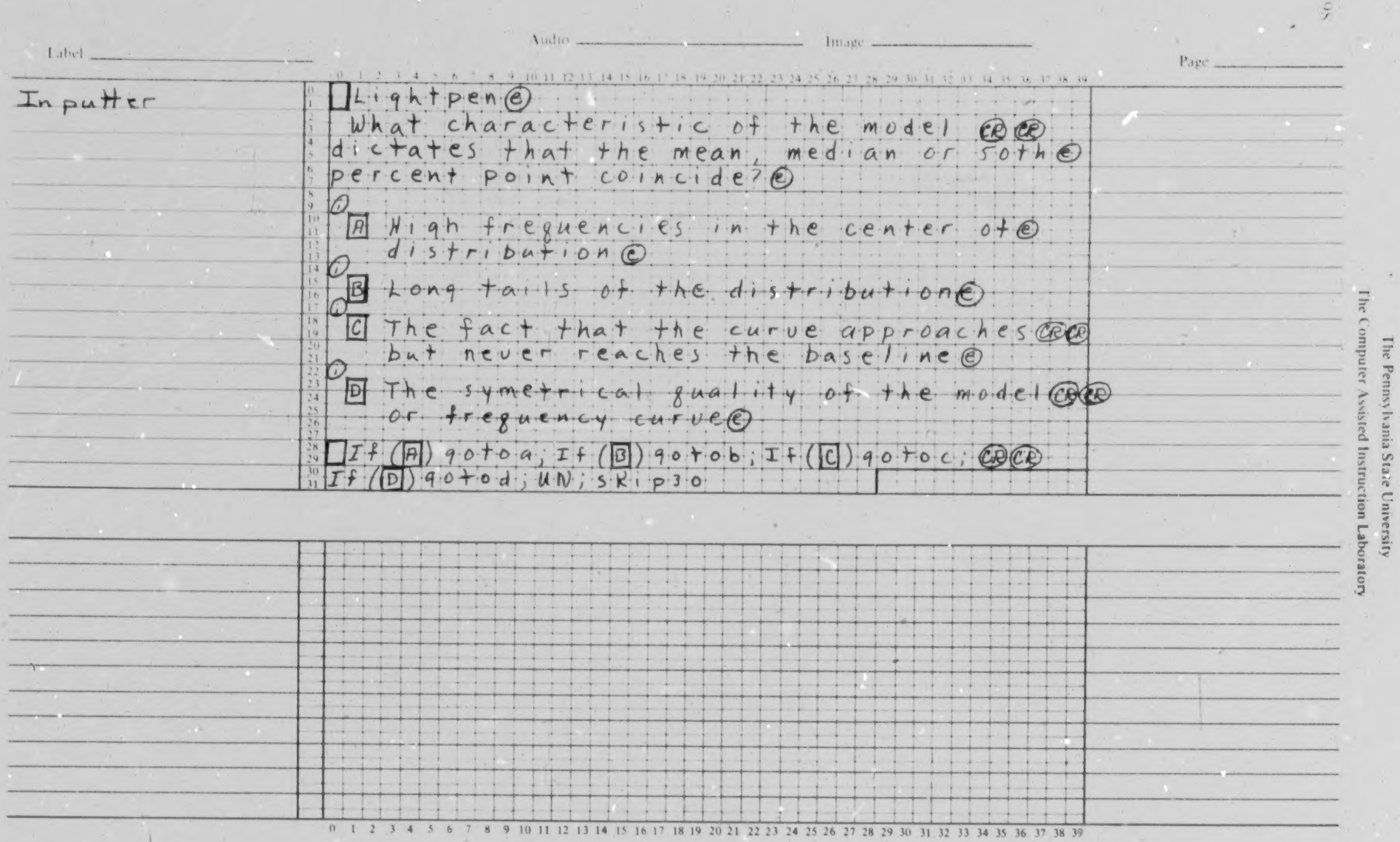
The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label
Audio
Image
Page

Inputter ☐ Insert 1 ⓔ
☐ Frame ⓔ
Computer Display → Is this a restart point? (yes or no)
Inputter → yes ⓔ

Figure 4.2. Sample of inputting sequence (2).



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label Inputter
Audio
Image
Page

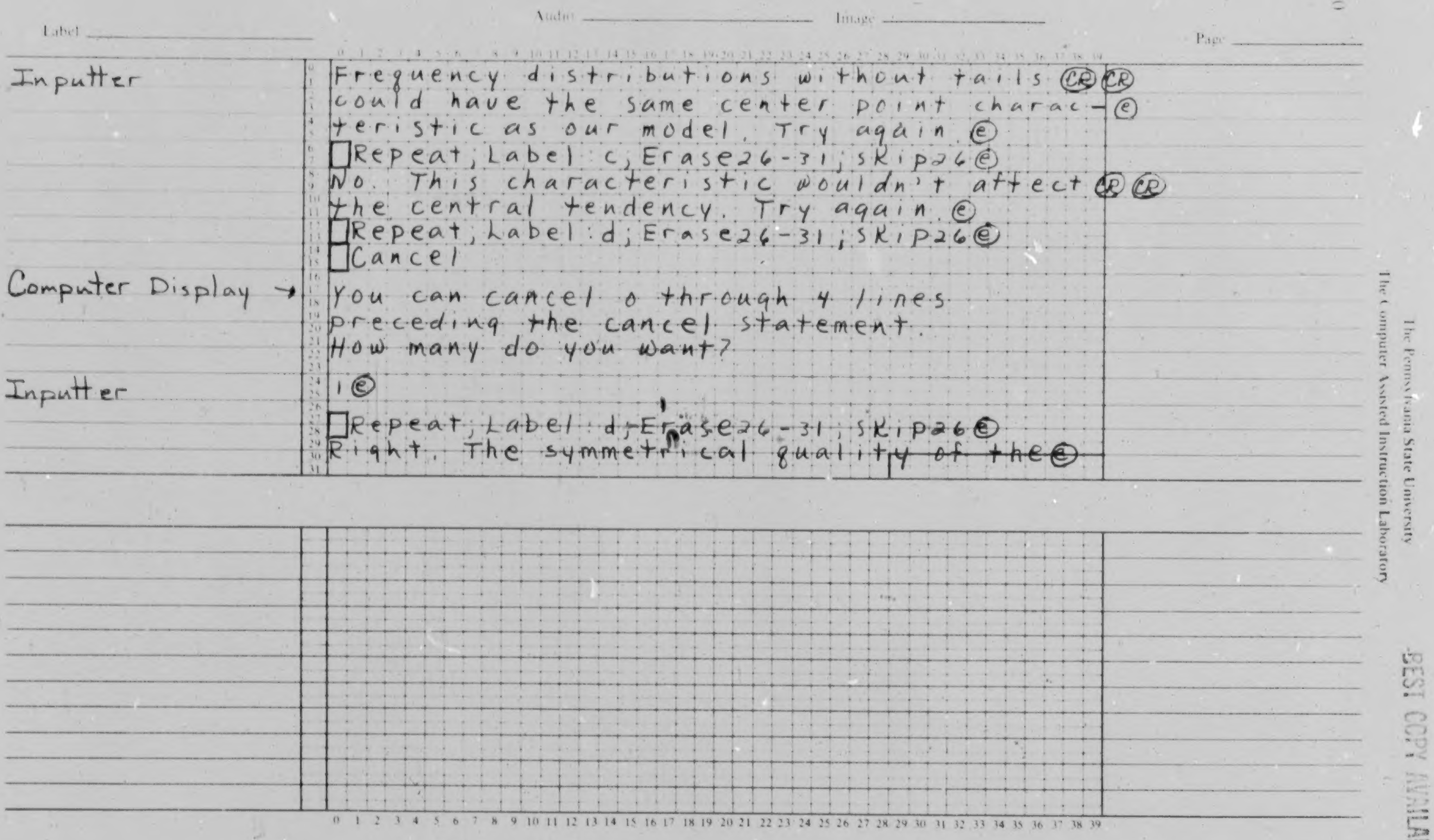
```
☐Lightpenⓔ
 What characteristic of the model (CR)(CR)
dictates that the mean, median or 50thⓔ
percent point coincide?ⓔ
ⓘ
  🄰 High frequencies in the center ofⓔ
    distributionⓔ
ⓘ
  🄱 Long tails of the distributionⓔ
ⓘ
  🄲 The fact that the curve approaches(CR)(CR)
    but never reaches the baselineⓔ
ⓘ
  🄳 The symetrical quality of the model(CR)(CR)
    or frequency curveⓔ
☐If (🄰) gotoa; If (🄱) gotob; If (🄲) gotoc; (CR)(CR)
If (🄳) gotod; UN; skip30
```

Figure 4.3. Sample of inputting sequence (3).

Label ________ Audio ________ Image ________ Page ________

Inputter	Touch your pen to a lighted box. ☐Cancel
Computer Display →	You can cancel 0 through 2 lines preceding the cancel statement. How many do you want?
Inputter →	2
	☐If ($\boxed{A}$) goto a; If ($\boxed{B}$) goto b; If ($\boxed{C}$) goto c; (CR)(CR) If ($\boxed{D}$) goto d; UN; Erase26-31; Skip30 ⓔ Touch your pen to a lighted box. ⓔ ☐Repeat; Label: a; Erase26-31; Skip26 ⓔ No. Frequency curves high on the ends and low in the middle could qualify. ⓔ Try again. ⓔ ☐Repeat; Label: B; Erase26-31; Skip26 ⓔ

Figure 4.4. Sample of CANCEL command (1).



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

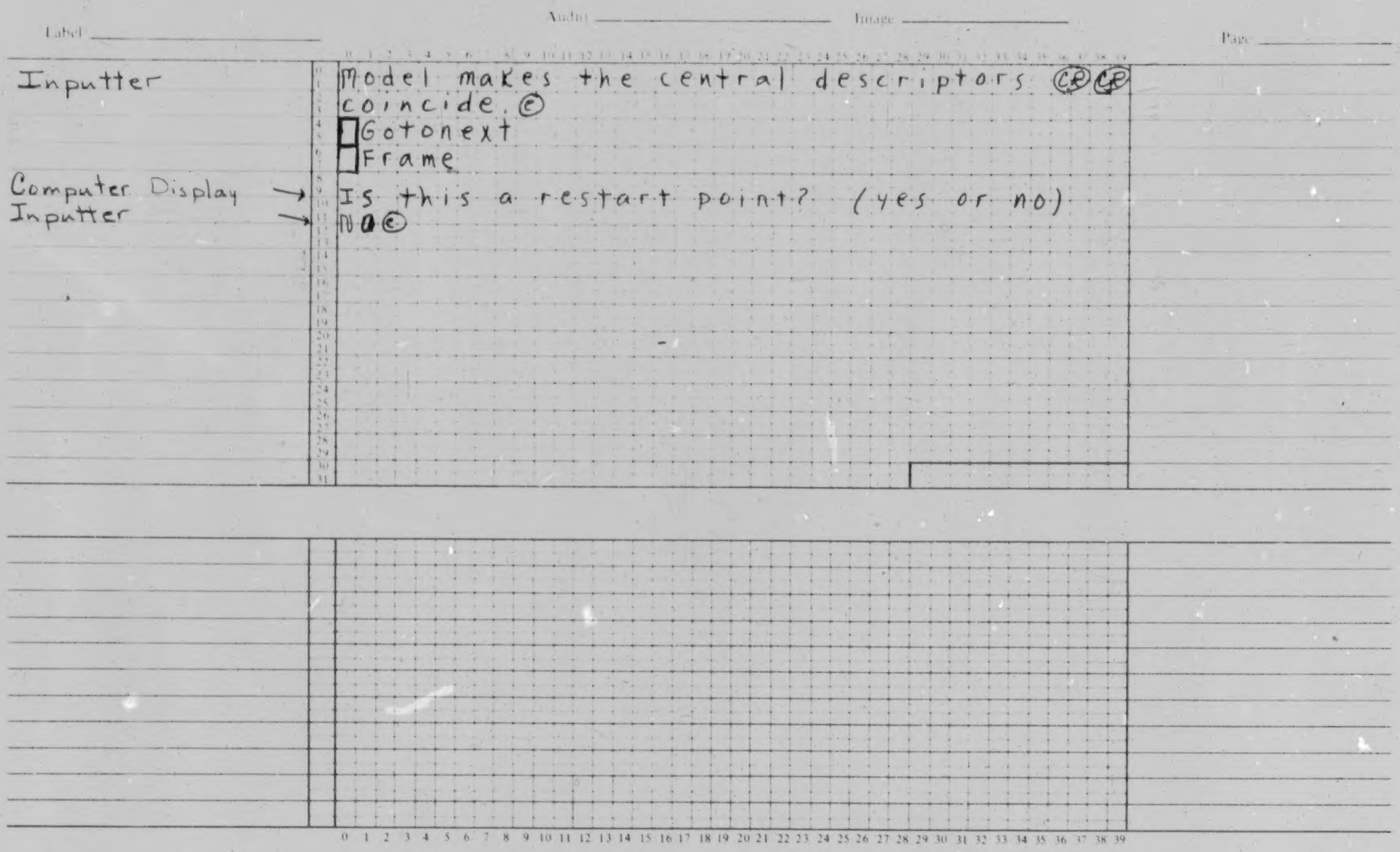
Label ____ Audio ____ Image ____ Page ____

Inputter
Frequency distributions without tails (CR)(CR)
could have the same center point charac- ⓔ
teristic as our model. Try again ⓔ
☐Repeat; Label c; Erase26-31; skip26ⓔ
No. This characteristic wouldn't affect (CR)(CR)
the central tendency. Try again ⓔ
☐Repeat; Label: d; Erase26-31; skip26ⓔ
☐Cancel

Computer Display →
You can cancel 0 through 4 lines
preceding the cancel statement.
How many do you want?

Inputter
1ⓔ
☐Repeat; Label: d; Erase26-31; skip26ⓔ
~~Right. The symmetrical quality of the~~ⓔ

Figure 4.5. Sample of CANCEL command (2).



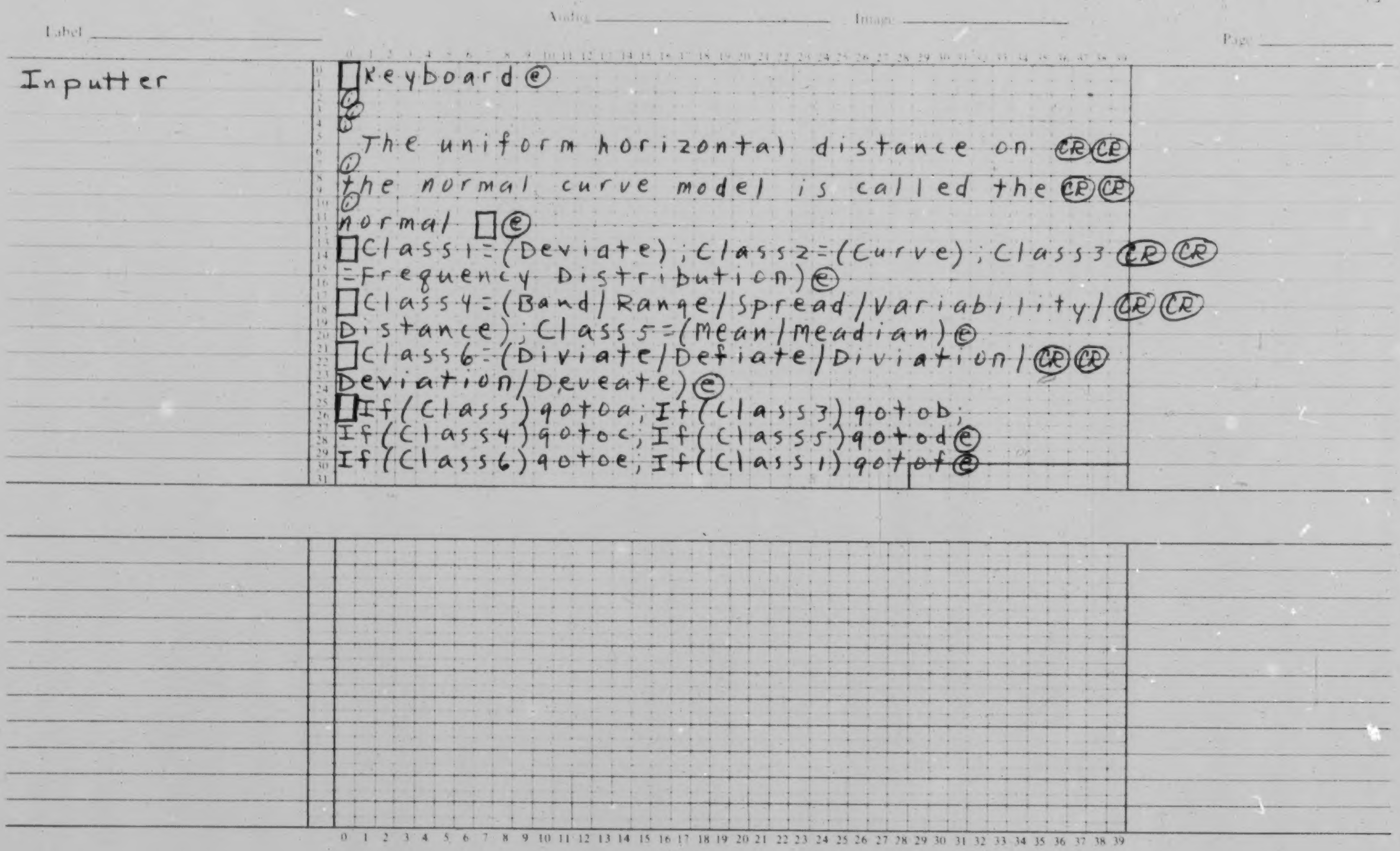
Label ____________ Audio ____________ Image ____________ Page ____________

Inputter
Model makes the central descriptors (CR)(CR)
coincide. ⓒ
☐Gotonext
☐Frame

Computer Display → Is this a restart point? (yes or no)
Inputter → NO ⓒ

Figure 4.6. Sample of FRAME inputting sequence.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label Inputter

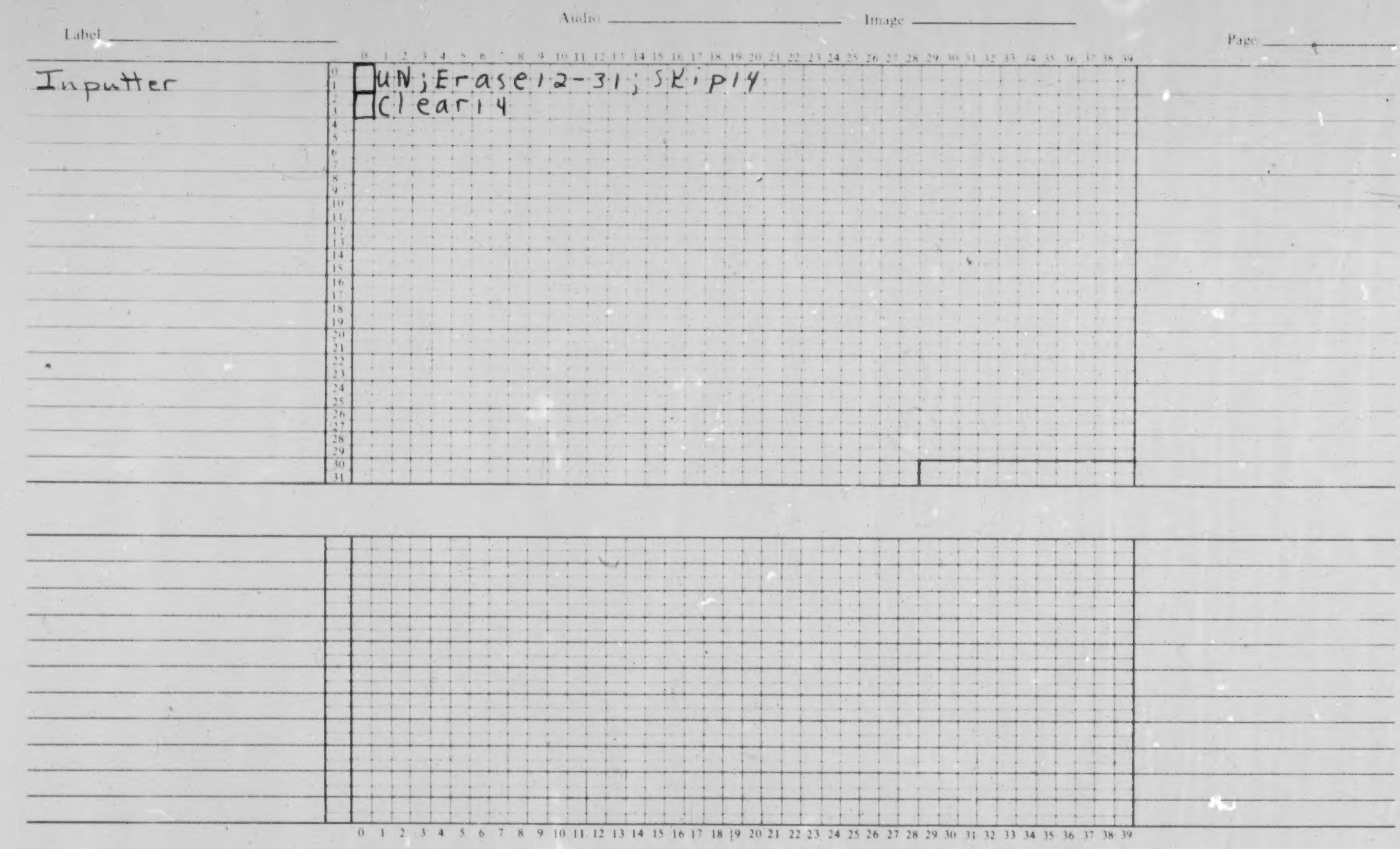
Audio

Image

Page

```
□Keyboardⓔ
ⓘ
ⓘ
ⓘ
 The uniform horizontal distance on (CR)(CR)
ⓘ
the normal curve model is called the (CR)(CR)
ⓘ
normal □ⓔ
□Class1=(Deviate);Class2=(Curve);Class3(CR)(CR)
=Frequency Distribution)ⓔ
□Class4=(Band/Range/Spread/Variability/(CR)(CR)
Distance);Class5=(Mean/Meadian)ⓔ
□Class6=(Diviate/Defiate/Diviation/(CR)(CR)
Deviation/Deveate)ⓔ
□If(Class)gotoa;If(Class3)gotob;
If(Class4)gotoc;If(Class5)gotodⓔ
If(Class6)gotoe;If(Class1)gotofⓔ
```

Figure 4.7. Continuation of figure 4.6.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label Inputter

Audio

Image

Page

```
UN;Erase12-31;SKip14
Clear14
```

Figure 4.8. Sample of CLEAR command.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label Inputter

Audio

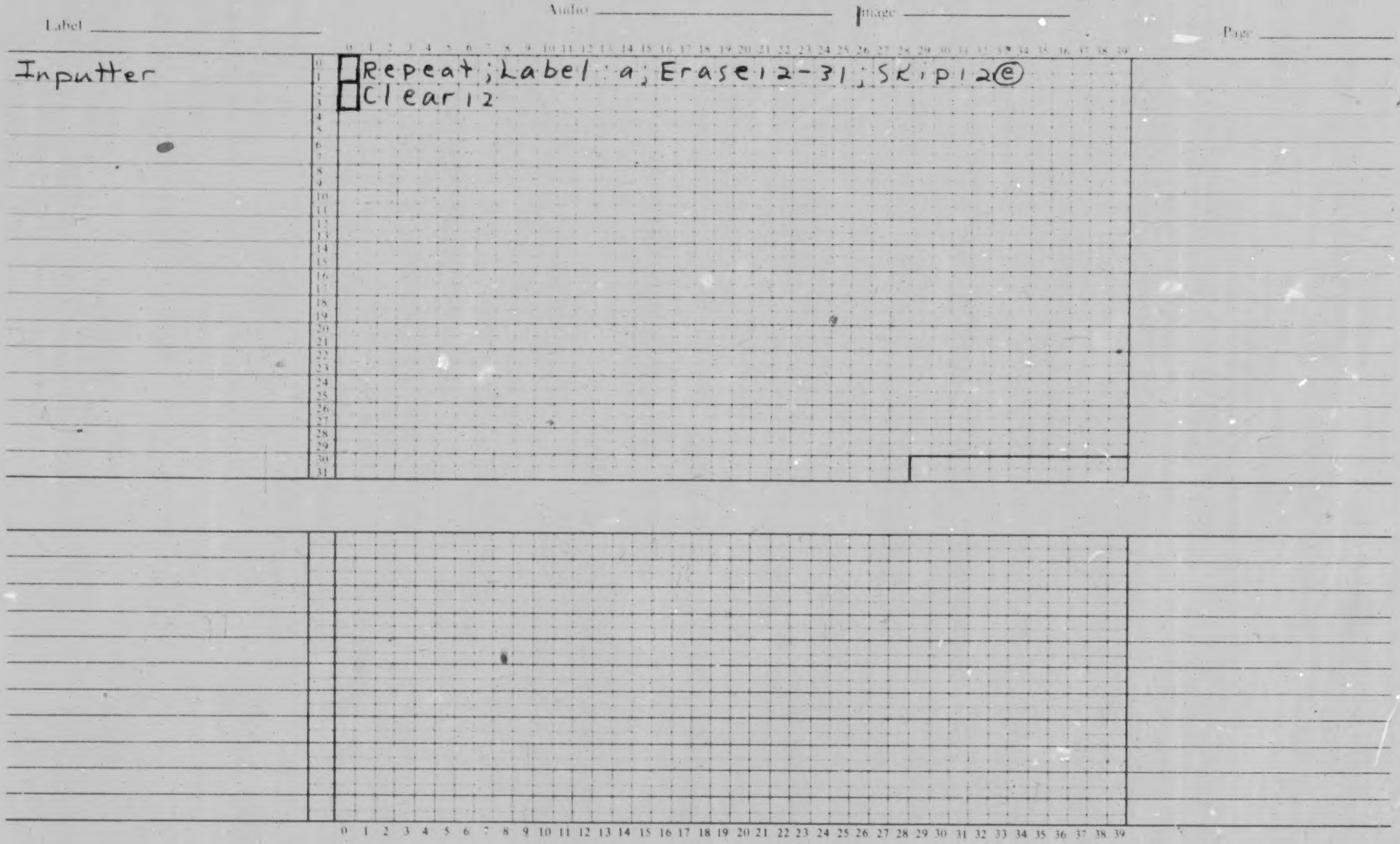
Image

Page

I'm sympathetic with the fact that this (CR)(CR)
is a new vocabulary for you. But, youⓔ
can see that in order to make use of the(CR)(CR)
normal curve model in describingⓔ
children's behavior and potential, it (CR)(CR)
would be necessary to have some sort ofⓔ
unit of measurement. In this case we (CR)(CR)
arbitrarily define the unit as theⓔ
normal deviate. Type: Deviate.

Figure 4.9. Continuation of figure 4.8.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label Inputter

Audio

Image

Page

☐ Repeat; Label: a; Erase 12-31; Skip 12ⓔ
☐ Clear 12

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Figure 4.10. Continuation of figures 4.8 & 4.9.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory

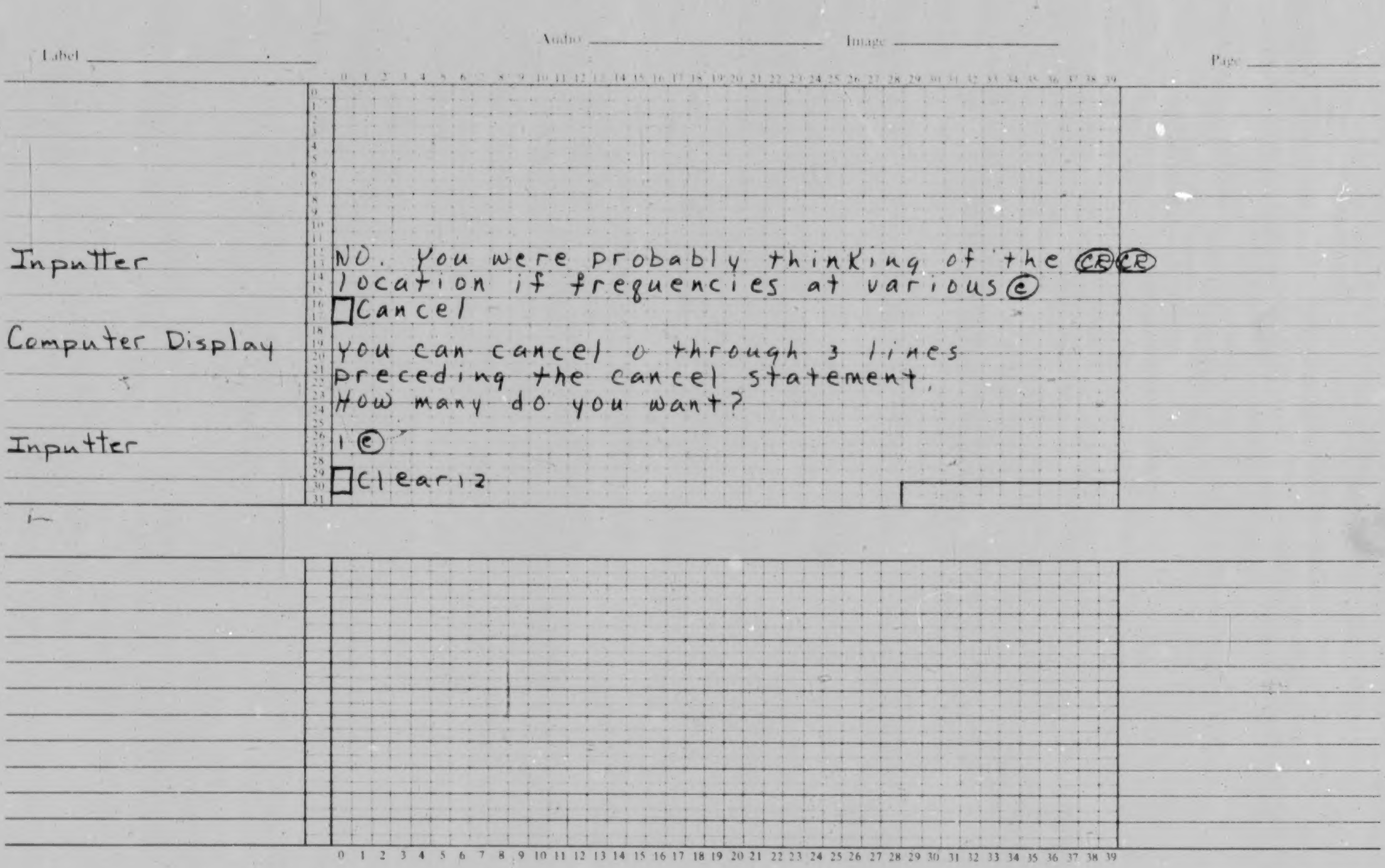
Label Inputter

Audio ______ Image ______ Page ______

NO. What does it mean to be separated (CR)(CR)
from a base or reference point? (E)
☐Repeat;Label:b;Erase12-31;Skip12
☐Clear12

Figure 4.11 Continuation of figures 4.8, 4.9 & 4.10.

The Pennsylvania State University
The Computer Assisted Instruction Laboratory



Label ____ Audio ____ Image ____ Page ____

Inputter
NO. You were probably thinking of the (CR)(CR)
location if frequencies at various ⓔ
☐Cancel

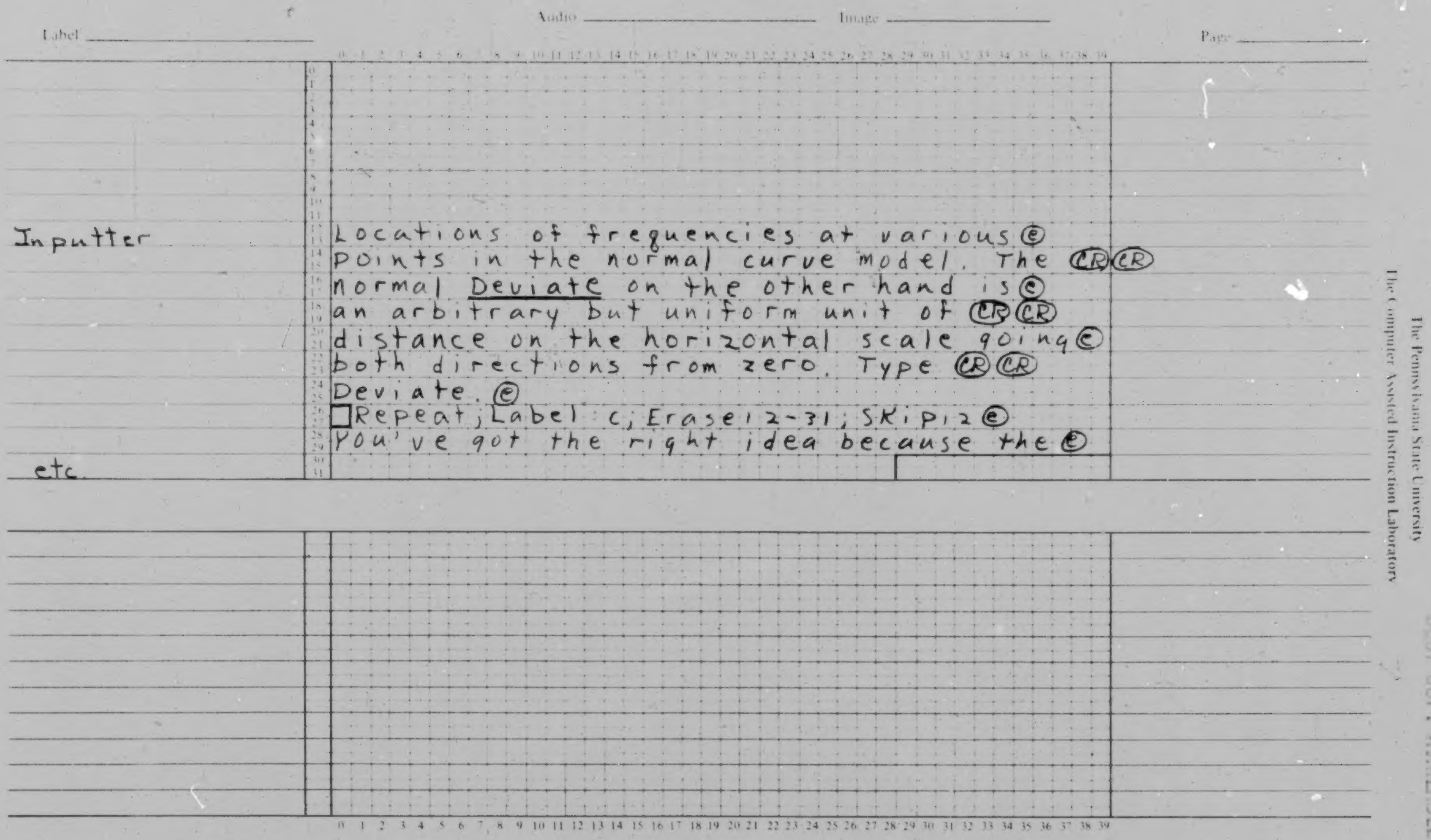
Computer Display
You can cancel 0 through 3 lines
preceding the cancel statement.
How many do you want?

Inputter
1 ⓔ
☐Clear 12

Figure 4.12 Continuation of figures 4.8, 4.9, 4.10 & 4.11.

The word "it" in rows 14 and 15 should have been the word "of". The inputter requested that one line of text be cancelled and then re-input only the last line of text beginning with "location of - - - ", as shown in Figure 4.13. Remember that *each* line of text is considered a separate instruction even though it was typed as two lines of text connected by two carriage returns.

Figure 4.14 shows the last set of instructions that were input for the chapter. Note that the inputter typed an alternate code q to signal the computer that the end of the TACL instruction for the chapter had been reached. Figure 4.15 shows the computer display following the alternate code q. At that point the inputter held down the alternate code key and pressed the index key to get the computer's attention. The inputter then typed and entered the word "off" after which the computer erased the screen and displayed "you have been signed off."



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ______ Audio ______ Image ______ Page ______

Inputter

Locations of frequencies at various ⓔ
points in the normal curve model. The (CR)(CR)
normal Deviate on the other hand is ⓔ
an arbitrary but uniform unit of (CR)(CR)
distance on the horizontal scale going ⓔ
both directions from zero. Type (CR)(CR)
Deviate. ⓔ
☐Repeat; Label c; Erase 12-31; Skip 12 ⓔ
You've got the right idea because the ⓔ

etc.

Figure 4.13 Sample of sign off procedure.

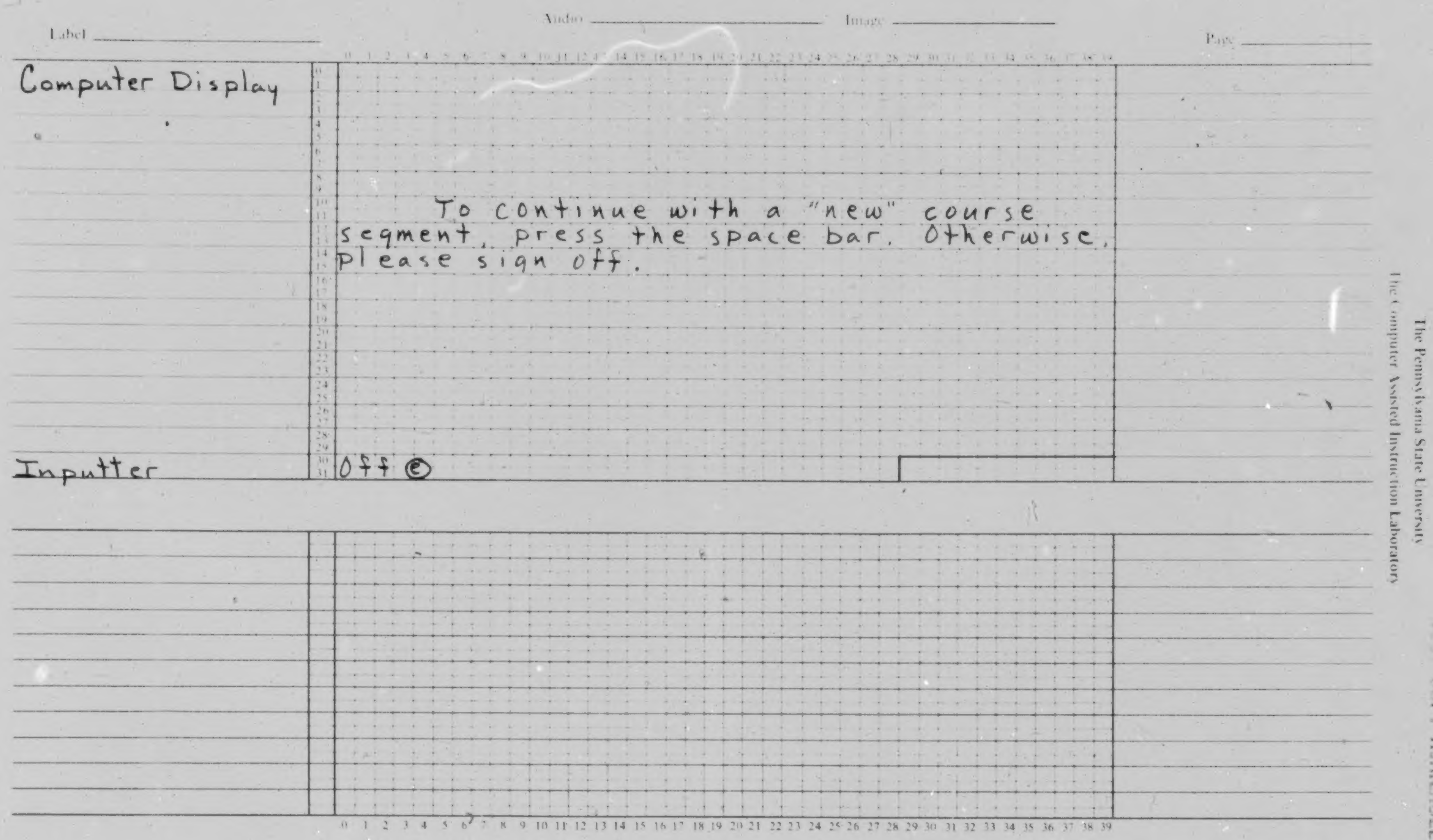
The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label Inputter

Audio ______ Image ______ Page ______

The more appropriate term. ⓔ
☐Repeat;Label:f;Erase12-31;Skip1r ⓔ
That's right. It's an arbitrary measure (CR) (CR)
of distance away from the mean. ⓔ
☐Gotonext ⓔ
ⓐ ⓔ

Figure 4.14 Continuation of figure 4.13.



The Pennsylvania State University
The Computer Assisted Instruction Laboratory

Label ____ Audio ____ Image ____ Page ____

Computer Display

To continue with a "new" course segment, press the space bar. Otherwise, please sign off.

Inputter

Off ©

Figure 4.15 Continuation of figures 4.13 & 4.14.

CHAPTER FIVE

TACL EDITING INSTRUCTIONS

The author does not yet exist who has written a chapter or a course and not wanted to revise the chapter at a later date. The curriculum development and evaluation cycles consisting of several formative evaluations, in which a small number of students test out the course material, greatly increases the probability that the "perfect" author will never exist. Data obtained from the formative evaluations are used to identify those portions of a chapter which many students find confusing and which should be rewritten. Many times a chapter is revised five or six times until the majority of the students are able to reach criteria. Even at that point the chapter could continually be revised so that all of the students, rather than a certain percentage (90) could successfully reach criterion.

In addition to the fact that an author does not yet exist who has not needed to revise a chapter after the chapter has been exposed to students, an inputter does not yet exist who has been able to input thousands of statements without making a typographical error. The TACL language contains instructions necessary for course revisions to allow the author to: *insert* additional instructions into a chapter; *delete* instructions from a chapter; *move* instructions from one location to another location within a chapter; *copy* instructions from one location to another location within a chapter; and *replace* one set of instructions with another set of instructions within a chapter.

Editing a Chapter

The most recent TACL listing must be used when revising a chapter. Each TACL instruction and each line of text has it's own unique statement number. The addition or deletion of either a TACL instruction or a line of text changes all of the succeeding statement numbers. The TACL editing instructions each refer to a specific statement number used to identify the exact location where the modifications are to be placed. The use of a TACL listing other than the most recent listing will produce erroneous results if the chapter has been edited prior to the location in the chapter where the current revisions are planned.

The TACL instructions to be added, deleted or changed in the chapter should be written directly on the TACL listing. Care should be taken to clearly identify the exact statement number that is to be changed. Large quanities of new material that are to be added to a chapter should be written on the appropriate coding forms and a notation made on the coding forms specifying the location where the new material is to be placed. Similarly, a notation should be made on the TACL listing at the exact location where the new material is to be placed.

Adding Additional Material

TACL instructions may be added to a chapter whenever necessary. Often one finds that an instruction was overlooked when the chapter was written. Many times a chapter is input in sections as each section is completed. Material is added to a chapter by using an INSERT instruction.

FORMAT: INSERT n_1

> where n_1 is the statement number immediately preceding the location at which the new instructions are to appear in the edited chapter.

All of the TACL instructions following the INSERT n_1 instruction will be inserted after n_1 until another editing instruction is encountered. Any number of TACL instructions may be inserted after statement n_1.

Removing TACL Statements

TACL instructions and lines of text may be removed or deleted from a chapter.

FORMAT: DELETE n_1

> where n_1 is the statement number of the statement to be deleted as it appears on the most recent TACL listing.

The DELETE n_1 instruction will delete *one* statement.

FORMAT: DELETE n_1 - n_2

All of the statements between and including n_1 and n_2 will be removed from the chapter.

Replacing TACL Statements

Replacing a TACL statement is to be thought of as deleting the unwanted statement and inserting the desired statement at that point. The two separate steps (delete and insert) have been combined into one statement.

FORMAT: REPLACE n_1

> where n_1 is the statement number of the line of text or TACL instruction which is to be replaced. Statement n_1 may be replaced with any number of statements. The author is not limited to replacing statements on a one-to-one basis.

FORMAT: REPLACE n_1 - n_2

All of the statements from and including n_1 to and including n_2 will be replaced with the statement(s) following the REPLACE n_1 - n_2 statement.

Relocating TACL Statements

The position of TACL statements within a chapter may be changed. TACL statements are most often moved from one location to another when the author desires to present a frame to a student at some point in the course other than was originally planned.

FORMAT: **MOVE n_1 - n_2/n_3**

All of the TACL statements between and including n_1 and n_2 will be inserted following statement number n_3.

Copying TACL Statements

Many times a section of code may be useful at other points within a chapter. For example, the code which analyzes student responses to a multiple choice test may be copied to each frame of the text. The section of code which compares alternative answer A with the student's response and presents the feedback "correct" if the student's response is A may be used with each test question that uses A as the correct answer.

FORMAT: **COPY n_1 - n_2/n_3**

where all of the statements between and including statements n_1 and n_2 will be copied and inserted after statement n_3. After the chapter is processed the instructions between statement number n_1 and n_2 will still be present and will also appear following statement n_3.

Warning: The TACL instruction LABEL: cccc (where cccc is a two-to-four character label beginning with a letter) should not be included within the instructions being copied since a duplicate label will then be created. However, a LABEL: c instruction may be present since the label c is unique within each frame.

Problems and Limitations

CANCEL. The MOVE instruction may not be cancelled because of additional instructions which are generated to accomplish the move.

When using the REPLACE instruction the CANCEL instruction may be used until another editing command is used. A REPLACE instruction may not be cancelled after another editing instruction has been used.

TEXT. When modifying lines of text contained in a TACL program, care must be taken to maintain the spacing between rows. A line of text not preceded by a SKI instruction or a series of indices will be placed on the next available line following the last line of text. The use of a SKIP instruction or a series of indexes when modifying a line of text will help maintain the spacing between lines.

If text is inserted immediately following Coursewriter II code, a TACL instruction (SKIP) must be used before the text. If a TACL instruction does not appear between the Coursewriter II code and the text, the text will be considered to be another Coursewriter II instruction rather than a line of text.

COPY AND MOVE. TACL instruction or text to be copied or moved may not be edited in either it's original position or new position until there is a new listing from which to work after the request has been processed. Editing instruction may not be used to edit material to be copied. The text or TACL instruction may not be edited in its new position until the requrest which moved or copied the statements has been processed.

CHAPTER SIX

TACL OPERATING PROCEDURES
(Systems Staff)

Preparing 1500 System for TACL Inputting

TACL statements are entered into the 1500 system and stored on magnetic tape for later processing. A Coursewriter II segment called AUTHO-64 is used in student mode to input TACL statements. AUTHO-64 uses the following functions: BUILD; DT; ED; EI; EP; MV; PSREMV; PSTRIT; SE. The Penn State patch which automatically branches to the second statement in the segment when either an alternate-coded q is typed and entered or the light pen is pointed at the P should also be installed in the system. AUTHO-64 has the following dictionary assignments:

0 - system
1 - math-science
2 - graph
3 - dot dictionary

as the TACL statements are entered via AUTHO-64, the statements are written into a magnetic tape using the function PSTRIT. The PSTRIT function writes the TACL instructions on the magentic tape *not* being used for performance recording. The separation of TACL statements from performance records increases the efficiency of both TACL processing and student performance record processing.

The following instructions should be executed to prepare the 1500 system for TACL input after the 1500 system has been restarted (or cold started) and initiailized:

If student performance records are being generated:

If student performance records are *not* being generated:

To initialize a TACL tape

1. Mount and ready the TACL tape on drive 0.
2. Mount and ready the performance tape on drive 1.
3. Use the PE proctor command to open the performance tape.
4. Begin inputting TACL statements.

1. Mount and ready the TACL tape on drive 0.
2. Begin inputting TACL s statements.

To continue a TACL tape

1. Mount and ready the TACL tape on drive 0.
2. Sign on a station (0 or 31) in the following manner: **ON SYSTM/TAPE**. At Penn State, the course **SYSTEM** will execute the coding between the labels **POSIT** and **EPOSIT** in the course **HEX-0**. The pertinent instruction in the sequence is **FN PSTRIT**/80,0,99e
3. The TACL tape will then position itself at the end of file mark and sign off the station.
4. Use the PE proctor command to open the performance tape.
5. Begin inputting TACL statements.

1. Mount and ready the TACL tape on drive 1.
2. Sign on a station (0 to 31) in the following manner: **ON SYSTM/TAPE**. At Penn State, the course **SYSTM** will execute the coding between the labels **POSIT** and **EPOSIT** in the course **HEX-0**. The pertinent instruction in the sequence is **FN, PSTRIT**/80,0,99e.
3. The TACL tape will then position itself at the end of file mark and sign off the station.
4. Begin inputting TACL statements.

To close the TACL Tape

1. Use the PE proctor command (PE i.e. d) to write an end-of-file mark on the TACL tape and unload the tape.

Operation I: Execute TCOPY

Function of TCOPY

To write on disk/1ABC the contents of a raw input tape containing TACL code.

Procedure

- A. Mount 1130 monitor disk and /1ABC disk on any drive.
- B. Mount run input tape (ring out) on drive 0.
- C. Input the following records from the card reader:
  1. // JOB
  2. // XEQ TCOPY
  3. (Blank Card)
- D. After the tape is read and its contents written on /1ABC, it will rewind and unload.

Operation II: Execute TACL

Function of TACL

To compile TACL statements.

Procedure

A. Mount and ready TACL disks.
  1. 1130 Monitor
  2. /1ABC (A blank scratch disk)
  3. 1500 scratch logical 1. (A blank scratch disk)

B. Cold start 1130 monitor.

C. Execute TCOPY if raw input is not on /1ABC.

D. Input the following records from the card reader:
  1. // JOB
  2. // XEQ TACL

TACL Input Card(s)

A. General form (see input card examples, p.120.)The following items are punched on one card with separating commas. The first four items (1 - 4), are required. The last three, (5 through 7), are optional. An optional item which is omitted must have a comma to indicate its absence if a subsequent item or option is included.
  1. Mode: either INIT for the creation of a new course or EDIT for the modification of an existing course.
  2. COURSE: course name.
  3. SEG: course segment
  4. AUTHOR NO.: author number specified during input.
  5. BEG FRAME: beginning frame number at which listing is to begin. (default beginning of course).
  6. END FRAME: ending frame number at which the listing is to end. (default end of course).
  7. OPTIONS: option names (if any) are typed one after another without separating blanks or commas.
     a) Option (names and defaults):

NAME	DEFAULT
(NO) CARD	NO CARD
(NO) TAPE	NOTAPE
(NO) PRNT	PRNT
(NO) SORT	SORT
(NO) LINK	LINK
(NO) EDIT	EDIT

B. Explanation of option names:

1) The card option is to be used for card input to TACL. The format of the CARD input is full EDCIDIC which can easily be obtained from an existing coursewriter II segment by using the no convert option of LSTCS. When the card option is used the first card of the deck must use the following format:

`**NAME LL`

where NAME is the course name and LL is the two letter segment identifier. The last card of the deck must be *END. When NO CARD is selected, card input will not be used.

2) If the TAPE option is used, all printed output will go to TAPE Drive 0. The END record will cause the tape to rewind and unload. If the NOTAPE option is in effect, all output will be printed on the printer.

3) If the PRNT option is in effect, the raw input will be printed. If NOPRNT is used, the raw input will not be printed.

4) (NO)SORT: (NO) execution of the TSORT phase.

5) (NO)LINK: (NO) execution of the EDLNK phase.

6) (NO)EDIT: (NO) execution of the TEDIT phase.

Number of Cards

Each TACL input card corresponds to one TACL job. There may be any number of TACL input cards.

END record

*END signifies the end of the TACL job(s).

A. Execute CRDASY and/or LSTCS (if desired).

1. CRDASY. A TACL job creates a card assembly work file on the 1500 scratch logical 1 disk. This work file contains unassembled Coursewriter II code for the course segment specified on the TACL input card. CRDASY must be executed to obtain executable Coursewriter II code.
2. LSTCS. Any list course (LSTCS) program will list the assembled Coursewriter II course segment on the printer.

Tape Handling and Printed Output

A. Tape Output. Mount and ready a scratch tape (ring in) when drive 0 has been selected.

B. Printer Output.
1. The TSORT Phase is executed if the SORT option is in effect.
   a. The message "Executing TSORT" is the initial message.
   b. The course, segment and author number of this job will be printed.
   c. The raw input is printed if the PRNT option is in effect.
2. The EDLNK phase is executed if the LINK option is in effect.
   a. In the EDIT mode, tape drive 1 will be selected. Mount and ready the current master tape (ring out). INIT mode does not use a current master tape.
   b. Error messages, if any, are printed.
   c. Tape drive 1 rewinds and unloads the current master.
3. The TEDIT Phase is executed if the EDIT option is in effect.
   a. When drive 1 is selected, mount and ready scratch tape (ring in) to create new master.
   b. A TACL listing of the course created or edited by the raw input is printed.
   c. Warning message may appear throughout the listing.
   d. The new master tape on drive 1 is rewound and unloaded.

Notes

A. Tape Readying:

Due to a hardware peculiarity, a tape drive must be selected before a tape may be readied on any drive. Failure to wait for a select condition will cause the monitor system to fail.

B. Input Card Examples
1. EDIT, CARE 2, JM, J13 -- (All optional items omitted)
2. INIT, ME402, BS, K111,,,TAPENOPRNT – (Two optional items and two option names used. Two extra commas indicate the two omitted items, BEG FRAME and END FRAME.)
3. EDIT, CARE 2, DE, J28, 999 – (Because the BEG FRAME is 999, the listing tries to start at a point beyond the END FRAME. Thus, the entire listing will be suppressed.)

C. After the TACL program is successfully completed a Coursewriter II workfile assembly may be performed to credit the actual Coursewriter II code.

TACL Operating Procedure

Key to Flowchart

1. Ready TACL Disks: a) 1130 Monitor; b) TACL/1ABC; c) 1500 Scratch Logical 1.
2. Make sure primary printer is ready.
3. Is raw input copied on TACL/1ABC from raw input tape?
4. Execute TCOPY.
5. Begin execution of TACL.
6. Input into card reader: // JOB; // XEQ TCOPY (blank card).
7. Input into card reader: // JOB; // XEQ TACL; TACL input card(s), *END (blank card).
8. When tape drive 0 is selected, mount and ready raw tape (ring out).
9. One TACL input card ready.
10. When raw input tape rewinds and unloads, dismount it.
11. Is tape option in effect?
12. Is end card read?
13. Is CRDASY to be executed?
14. Is list tape mounted and readied (ring in) on drive 0 ?
15. Is card option in effect?
16. Bring down 1130 system and cold start 1500 system.
17. When tape drive 0 is selected, mount and ready scratch tape (ring in) for printer output.
18. Read deck.
19. Execute CRDASY.
20. When tape drive 1 is selected, mount and ready scratch tape (ring in) for printer output.
21. Is LSTCS to be executed?
22. Do more TACL jobs remain?
23. When current master rewinds and unloads, dismount it.
24. Bring down 1500 system and cold start 1130 system.
25. Termination.
26. When tape drive 1 has been selected, mount and ready scratch tape (ring in) for the creation of new master.
27. Execute LSTCS.
28. When new master rewinds and unloads, and TACL has been listed, dismount new master.

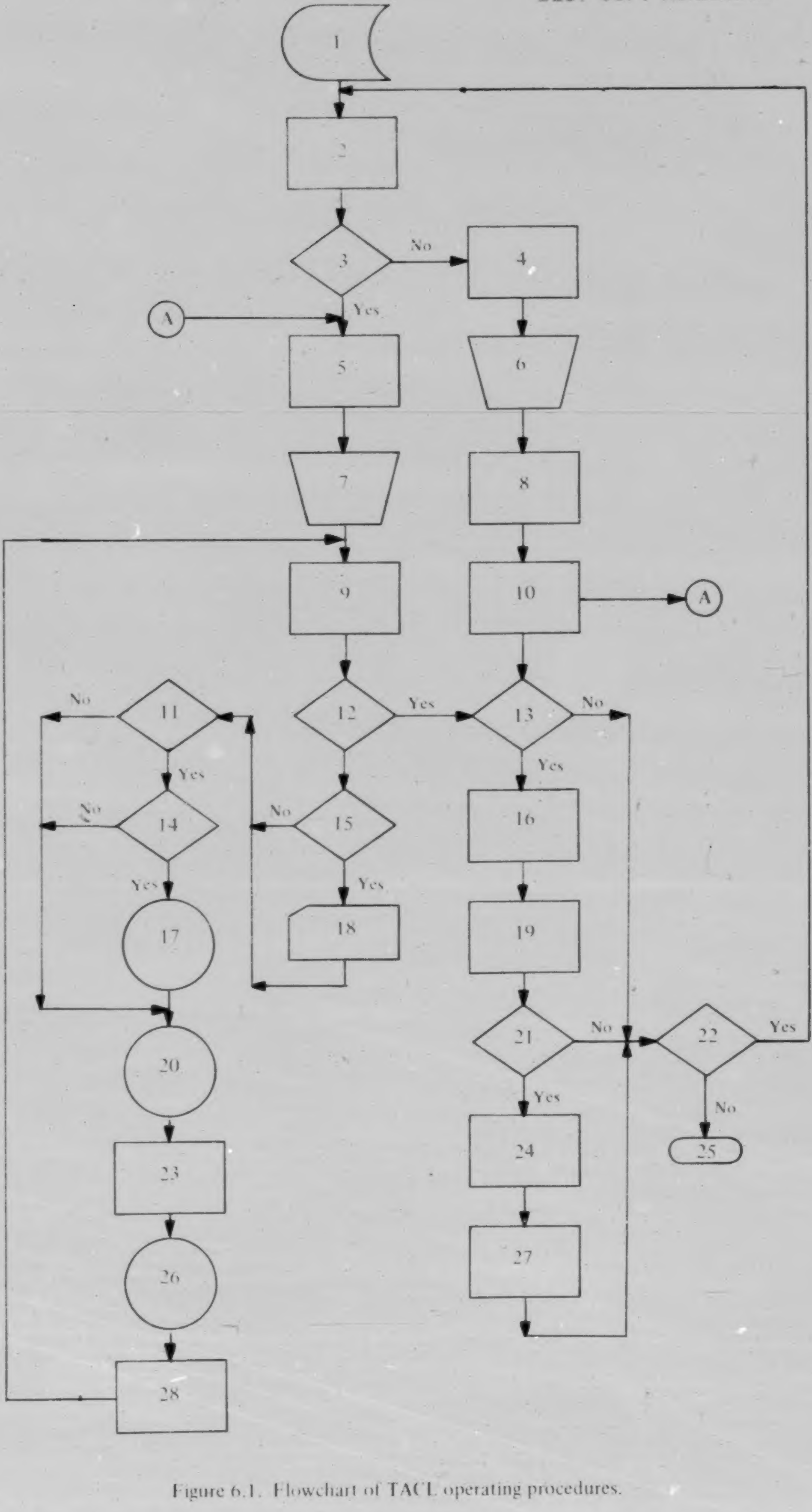


Figure 6.1. Flowchart of TACL operating procedures.

PSU LAB PROCEDURES

A. The following procedures are Penn State University Computer Assisted Instruction Laboratory operational procedures and are presented here as a guideline for operation. They are intended to present to the new TACL user a base from which to develop specific installation procedures and not as set form of operation.

B. Labeling

1. The tape reels are labeled with masking tape. The following steps are performed during the TACL job.
    a. The existing current master tape used in the TACL job becomes the backup tape and is placed on the rack as a backup with the backup tape seal, labeled with only the segment letters of the course. (Exception: when creating a new course, a current master tape does not exist and the system will not call for one).
    b. A new master tape for the course being run starts out as a scratch tape and is labeled with the course name, segment letters, and the existing current master edit number plus one. (When creating a new course, "INIT" is used as the edit number.) After its creation by the TACL job, it becomes the current master and is placed on the rack with the current master tape seal. Remove the write ring.
    c. The existing backup tape becomes a scratch tape.. Insert a write ring and place in the scratch tape rack with the last course and segment label moved from the body of the tape to the tape reel.
2. If the job does not execute satisfactorily, the labeling procedure must be undone and the tapes placed in the rack as they were originally.

Improper Terminations

A. There are two occasions when debugging information is needed: after a "crash" and during "looping" of the TACL system.

1. Write the contents (in hexadecimal) of the instruction address register (IAR) and the accumulator and extension registers.
2. Rerun the job with console switch 4 on.
3. When the systems "crash" occurs again, get a core dump by executing the resident core dump. If this dump fails to work, use "DUMP 1403."
    a. Resident core dump.
        1) Turn mode switch on CPU to LOAD.
        2) Turn console switch 9 on (other switches off).
        3) Press LOAD IAR on the CPU. A 0040 (in hexadecimal) will be stored into the IAR.
        4) Turn mode switch back to RUN.
        5) Push PROGRAM START.

   - b. DUMP 1403.
     - 1) Ready card reader with card deck labeled **DUMP 1403** which is found in the utilities drawer of the card file.
     - 2) Press **IMMEDIATE STOP**, **RESET**, and **PROGRAM LOAD**.
4. Get a partial disk dump of **TACL/IABC**. If the crash occurred in TSORT, dump sectors 17 to 30. If it occurred in EDLNK or TEDIT, dump sectors 17 to 30 and sectors 100 to 130. To execute disk dump, do the following:
   - a. Ready the **DCLPX** deck on the reader which is found in the utilities drawer of the card file.
   - b. Push **IMMEDIATE STOP** and **RESET** buttons on the CPU.
   - c. Push the **PROGRAM LOAD** button on the CPU.
   - d. After the deck has been read, the CPU will come to a wait.
5. Push **PROGRAM START**.

B. **LOOPING** occurs when TACL I/0 stops and the CPU run light remains on. In this case do the following:

1. Push the **IMMEDIATE STOP** button on the CPU.
2. Turn the CPU **MODE** switch to single instruction (SI).
3. Write down the contents (in hexadecimal) of the instruction address, accumulator and accumulator extension. Then, press **PROGRAM START**.
4. Repeat step 3. until the instruction address register repeats itself or until PROGRAM START has been pushed 25 to 30 times, whichever comes first.
5. Get a core dump (see core dump explanation in the "CRASH" procedures).
6. Get appropriate disk dumps (see disk dump explanation in "CRASH" procedures).

C. Give all debugging information to **SYSTEM'S PROGRAMMER**.

APPENDIX A

```
STATEMENT        TACL                TACL                          1         2         3
 NUMBER         OPCODES                AA               0123456789012345678901234567890123456789    FRAME NO.    01

          .
 00001    &FRAME
                                                     00
                                                     01
                                                     02
                                                     03
                                                     04
                                                     05
                                                     06
                                                     07
                                                     08
                                                     09
                                                     10
                                                     11
                                                     12
                                                     13
                                                     14
                                                     15

          .
 00002    &SKIP 16                                   16                 -
 00003                                               17                 CHAPTER 7
          .
 00004    &PAUSE02
                                                     18
                                                     19

          .
 00005    &SKIP 20                                   20     -          -                -
 00006                                               21     INDIVIDUAL DIFFERENCES AND NORMALITY
```

```
STATEMENT      TACL              TACL                 1         2         3
NUMBER         OPCODES             AA       0123456789012345678901234567890123456789   FRAME NO.   02

00007        &FRAME
                                        00
                                        01

00008        &SKIP 02                   02   -
00009                                   03     SUPPOSE WE ARE INTERESTED IN STUDYING
                                        04
                                        05
00010                                   06   THE HEIGHT OF THE EIGHT-YEAR-OLD
                                        07
                                        08
00011                                   09   CHILDREN IN OUR HOME TOWN.
                                        10
                                        11   -
00012                                   12     ONE OF THE QUESTIONS WE WOULD
                                        13
                                        14
00013                                   15   PROBABLY WANT TO ASK IS, "HOW TALL ARE
                                        16
                                        17
00014                                   18   MOST OF THE EIGHT-YEAR-OLD CHILDREN?"
                                        19
                                        20   -
00015                                   21     THE MOST DIRECT WAY OF FINDING THE
                                        22
                                        23
00016                                   24   ANSWER TO THE QUESTION IS BY MEASURING
                                        25
                                        26
00017                                   27   EACH CHILD AND RECORDING THE DATA.
```

```
STATEMENT      TACL              TACL                       1         2         3
NUMBER         OPCODES           AA                 0123456789012345678901234567890123456789   FRAME NO.   03

               .
00018          &FRAME
                                                00
                                                01
                                                02
                                                03
                                                04
                                                05

               .
00019          &SKIP 06                         06    -
00020                                           07         PLEASE PUT ON YOUR EARPHONES
                                                08
                                                09
00021                                           10         AND THEN PRESS THE SPACE BAR
                                                11
                                                12
00022                                           13         WHEN YOU ARE READY.
               .
00023          &PAUSE

               .
00024          &SHOW IMAGE 351

               .
00025          &ERASE

               .
00026          &PLAY AUDIO 1

                                                  ****************************************************

               .
00027          &SKIP 00                         00    -
00028                                           01    S 13
                                                02    -
00029                                           03    O 12
                                                04    -
00030                                           05    [illegible] 11
                                                06    -
00031                                           07    [illegible] 10
                                                08    -
00032                                           09    E  9
                                                10    -
00033                                           11    [illegible]  8
                                                12    [illegible]  [illegible]
00034                                           13     OF  7
                                                14    A  1
00035                                           15     F  [illegible]
                                                16    -
00036                                           17    C  5
                                                18    -
00037                                           19    F  4
                                                20    -
00038                                           21    I  3
                                                22    -
00039                                           23    L  2
                                                24    -
```

BEST COPY AVAILABLE

```
00040                                 25    D  1
                                      26    -    ** ** ** ** ** ** ** ** ** ** **
00041                                 27         46 47 48 49 50 51 52 53 54 55 56
                                      28    -
00042                                 29
                                      30    -             -
00043                                 31                  HEIGHT IN INCHES
        .
00044   &RESUME AUDIO
                                        **************************************************

        .
00045   &SKIP 24                      24    -                       --
00046                                 25    D  1                    J
        .
00047   &PLAY AUDIO 2
```

```
STATEMENT     TACL          TACL                      1         2         3
 NUMBER       OPCODES        AA             0123456789012345678901234567890123456789   FRAME NO.   04

          .
 00048    &FRAME
          .
 00049    &LIGHT PEN                   00   -
 00050                                 01    WHAT CHARACTERISTICS OF THE MODEL
                                       02
 00051                                 03   DICTATES THAT THE MEAN, MEDIAN OR 50TH
                                       04
 00052                                 05   PERCENT POINT COINCIDES?
                                       06
                                       07
                                       08    * -
 00053                                 09    A HIGH FREQUENCIES IN THE CENTER OF
                                       10
 00054                                 11      DISTRIBUTION.
                                       12
                                       13    * -
 00055                                 14    B LONG TAILS OF THE DISTRIBUTION
                                       15
                                       16    * -
 00056                                 17    C THE FACT THAT THE CURVE APPROACHES
                                       18
 00057                                 19      BUT NEVER REACHES THE BASE LINE
                                       20
                                       21    * -
 00058                                 22    D THE SYMMETRICAL QUALITY OF THE MODEL
                                       23
 00059                                 24      OF THE FREQUENCY CURVE
```

BEST COPY AVAILABLE

```
STATEMENT       TACL            TACL                          1         2         3
NUMBER          OPCODES          AA             0123456789012345678901234567890123456789   FRAME NO.   05

                .
00060           &FRAME
                .
00061           &KEYBOARD                    00
                                             01
                                             02
                                             03
                                             04
                                             05
00062                                        06    THE PURPOSE OF THIS EXAMPLE IS TO
                                             07
00063                                        08  DEMONSTRATE THE USE OF THE KEYBOARD
                                             09                  -
00064                                        10  INSTRUCTION. IF A CURSOR DOES NOT
                                             11
00065                                        12  APPEAR WITHIN THE TEXT, THE CURSOR
                                             13
00066                                        14  WILL APPEAR ON THE NEXT AVAILABLE LINE
                                             15        ---
00067                                        16  OF THE CRT AFTER ALL OF THE TEXT IS
                                             17                  ---
00068                                        18  PLACED ON THE CRT.
                                             19
                                             20
                                             21    -
00069                                        22    WHERE WILL THE CURSOR APPEAR WITHIN
                                            *23               .
00070                                        24  THIS FRAME?
```

```
STATEMENT      TACL                 TACL                  1         2         3
 NUMBER       OPCODES                AA          0123456789012345678901234567890123456789   FRAME NO.    06

             .
 00071       &FRAME
             .
 00072       &KEYBOARD                     00
                                           01
                                           02    -
 00073                                     03    LET US REVIEW SOME OF THE IMPORTANT
                                           04
                                           05
                                           06
 00074                                     07  CHARACTERISTICS OF THE CURVE SHOWING
                                           08
                                           09
                                           10
 00075                                     11  ON THE PROJECTOR.
                                           12
                                           13
                                           14         -
 00076                                     15        1. THE VERTICAL DIMENSION.
                                           16
 00077                                     17           REPRESENTS NUMBER OF CASES
                                           18              .
 00078                                     19           [illegible] &
```

BEST COPY AVAILABLE

```
STATEMENT      TACL          TACL                           1         2         3
NUMBER         OPCODES         AA               0123456789012345678901234567890123456789    FRAME NO.    07

00079          &FRAME

00080          &KEYBOARD                        00
00081                                           01      THUS IF A CHILD HAS A SCORE
                                                02
00082                                           03
                                                04  OF 80 ON A TEST, AND THE MEAN OF THE
                                                05
00083                                           06
                                                07  TEST IS 60, THE CHILD DEVIATES 20   POINTS
                                                08
00084                                           09
                                                10  ABOVE THE MEAN.
```

```
STATEMENT     TACL              TACL                      1         2         3
NUMBER        OPCODES           AA             0123456789012345678901234567890123456789   FRAME NO.    OF

              .
00085         &FRAME

              .
00086         &LIGHT P N                       00   -
00087                                          01    WHAT CHARACTERISTIC OF THE MODEL
                                               02
00088                                          03   DICTATES THAT THE MEAN, MEDIAN OR 50TH
                                               04
00089                                          05   PERCENT POINT COINCIDES?
                                               06
                                               07
                                               08    + -
00090                                          09    A HIGH FREQUENCIES IN THE CENTER OF
                                               10
00091                                          11      DISTRIBUTION.
                                               12
                                               13    + -
00092                                          14    B LONG TAILS OF THE DISTRIBUTION
                                               15
                                               16    + -
00093                                          17    C THE FACT THAT THE CURVE APPROACHES
                                               18
00094                                          19      BUT NEVER REACHES THE BASE LINE
                                               20
                                               21    + -
00095                                          22    D THE SYMMETRICAL QUALITY OF THE MODEL
                                               23
00096                                          24      OF FREQUENCY CURVE

              .  +
00097         &IF(A)GOTOA

              .  +
00098         &IF(B)GOTOB

              .  +
00099         &IF(C)GOTOC

              .  +
00100         &IF(D)GOTOD

              .
00101         &ON

              .
00102         &ERASE25- 31
                                               25
                                               26
                                               27

              .
00103         &SKIP 28                         28    -
00104                                          29    TOUCH YOUR PEN TO A
                                               30
00105                                          31   LIGHTED BOX.

              .
00106         &REPEAT
```

```
               .
00107     &LABEL. A
               .
00108     &ERASE26- 31
                                            ****************************************************

               .
00109     &SKIP 26                          26  -    -
00110                                       27  NO. FREQUENCY CURVES HIGH ON THE ENDS
                                            28
00111                                       29  AND LOW IN THE MIDDLE COULD QUALIFY.
                                            30  -
00112                                       31  TRY AGAIN.
               .
00113     &REPEAT
               .
00114     &LABEL. B
               .
00115     &ERASE26- 31
                                            ****************************************************

               .
00116     &SKIP 26                          26  -
00117                                       27  FREQUENCY DISTRIBUTIONS WITHOUT TAILS
                                            28
00118                                       29  COULD HAVE THE SAME CENTER POINT CHARAC-
                                            30                                 -
00119                                       31  TERISTICS AS FOR MODEL. TRY AGAIN.
               .
00120     &REPEAT
               .
00121     &LABEL. C
               .
00122     &ERASE26- 31
                                            ****************************************************

               .
00123     &SKIP 26                          26  -    -
00124                                       27  NO. THIS CHARACTERISTIC WOULDN'T AFFECT
                                            28                            -
00125                                       29  THE CENTRAL TENDENCY. TRY AGAIN.
               .
00126     &REPEAT
               .
00127     &LABEL. D
               .
00128     &ERASE26- 31
                                            ****************************************************

               .
00129     &SKIP 26                          26
```

BEST COPY AVAILABLE

```
00130                                           27  RIGHT. THE SYMMETRICAL QUALITY OF THE
                                                28
00131                                           29  MODEL MAKES THE CENTRAL DESCRIPTORS
                                                30
00132                                           31  COINCIDE.

00133     &GOTO NEXT
```

```
STATEMENT      TACL              TACL                          1                   3
 NUMBER       OPCODES             AA           0123456789012345678901234567890123456789    FRAME NO.    09

               .
 00134       &FRAME
               .
 00135       &SHOW IMAGE 513
               .
 00136       &KEYBOARD
                                              00
                                              01
                                              02
                                              03

               .
 00137       &SKIP 04                         04     -  -            -
 00138                                        05        LOOK AT THE IMAGE CAREFULLY. IS THE
                                              06
                                              07                                       1.0
 00139                                        08  SPACE UNDER THE CURVE BOUNDED BY -3 =  AND
                                              09
                                              10    1.0
 00140                                        11  -1 = , THE SAME AS THE SPACE BOUNDED BY
                                              12
                                              13    1.0        .  -  -      4B....      8B..  .
 00141                                        14  -2 = , AND GO  TYPE YES   --- OR NO   --. &
               .
 00142       &IF(YES)GOTOY
               .
 00143       &IF(NO)GOTON
               .
 00144       &ON
                                              15
                                              16
                                              17
                                              18
                                              19
                                              20
                                              21
                                              22
                                              23
                                              24
                                              25
                                              26
                                              27

               .
 00145       &SKIP 28                         28  ..        -
 00146                                        29  THE ANSWER IS NO. THE AREAS DO DIFFER.
               .
 00147       &GOTO NEXT
               .
 00148       &LABEL. N
                                              **************************************************
```

```
         .                             28  -              -
00149    &SKIP 28                      29  THAT'S RIGHT. THE AREAS UNDER THE CURVE
00150                                  30
00151                                  31  DO DIFFER.
         .
00152    &GOTO NEXT
         .
00153    &LABEL. Y
                                         ************************************************

         .                             26  -        -                1.0
00154    &SKIP 26                      27  NOT QUITE. ALTHOUGH BANDS ARE 2 = 'S WIDE
00155                                  28
00156                                  29  THEIR AREA DIFFERS BECAUSE OF DIFFERENT
00157                                  30
         .                             31  RELATIONSHIPS AT THE ZERO POINT.
00158    &GOTO NEXT
```

```
STATEMENT      TACL              TACL                            1         2         3
 NUMBER        OPCODES             AA            0123456789012345678901234567890123456789    FRAME NO.    10


          .
 00159    &FRAME*
          .
 00160    &KEYBOARD
                                            00

          .
 00161    &SKIP 01                          01       -
 00162                                      02       FOR PHYSICAL VARIABLES, SUCH AS
                                            03
                                            04
 00163                                      05       HEIGHT WE USE CHRONOLOGICAL AGE
                                            06
                                            07
 00164                                      08       AS A BASE LINE FOR COMPARISON.
                                            09
                                            10       -
 00165                                      11       CHRONOLOGICAL AGE REFERS TO THE
                                            12
                                            13
 00166                                      14       NUMBER OF YEARS, MONTHS, AND DAYS
                                            15
                                            16
 00167                                      17       A PERSON HAS LIVED.
                                            18
                                            19       -
 00168                                      20       WE USUALLY COMPARE CHILDREN WITH
                                            21
                                            22                 .
 00169                                      23       OTHERS THEIR OWN .
          .                  .
 00170    & CLASS1=(CHRONOLOGICALAGE/CA)
          .           .
 00171    & CLASS2=(CLASS/PEER)
          .
 00172    &IF(CLASS1)GOTOC
          .
 00173    &IF(CLASS2)GOTOW
          .
 00174    &UN
          .
 00175    &ERASE23- 30
                                            24
                                            25
                                            26
                                            27

          .
 00176    &SKIP 28                          28  -          -
 00177                                      29  TRY AGAIN. LOOK AT THE FIRST
```

BEST COPY AVAILABLE

```
                                          30   -  -
00178                                     31   SENTENCE FOR A CLUE.
        .
00179   &REPEAT
        .
00180   &UN
        .
00181   &ERASE28- 30
                                             **************************************************
        .
00182   &SKIP 30                          30   -
00183                                     31   AGE IS THE CORRECT ANSWER.
        .
00184   &GOTO NEXT
        .
00185   &LABEL. C
        .
00186   &ERASE28- 30
                                             **************************************************
        .
00187   &SKIP 28                          28   -   -
00188                                     29   GOOD. THAT'S CORRECT.
        .
00189   &GOTO NEXT
        .
00190   &LABEL. W
        .
00191   &ERASE28- 30
                                             **************************************************
                                                                 4
        .
00192   &SKIP 28                          28   -
00193                                     29   BUT, CHILDREN IN THE SAME CLASS OR PEER
                                          30                                     ......
00194                                     31   GROUP ARE USUALLY ABOUT THE SAME ------.
        .
00195   &REPEAT
```

```
STATEMENT     TACL                  TACL                        1         2         3
 NUMBER      OPCODES                 AA            0123456789012345678901234567890123456789   FRAME NO.    11

              .
00196       &FRAME

              .
00197       &KEYBOARD                                 00
                                                      01
                                                      02
                                                      03     -
00198                                                 04     THE UNIFORM HORIZONTAL DISTANCE ON
                                                      05
                                                      06
00199                                                 07   THE NORMAL CURVE MODEL IS CALLED THE
                                                      08
                                                      09          .
00200                                                 10   NORMAL &
              .
00201       & CLASS1=(DEVIATE)

              .
00202       & CLASS2=(CURVE)

              .
00203       & CLASS3=(FREQUENCYDISTRIBUTION)

              .           .      .         .              .
00204       & CLASS4=(BAND/RANGE/SPREAD/VARIABILITY/DISTAN

              .            .
00205       & CLASS5=(MEAN/MEDIAN)

              .                  .           .           .            .
00206       & CLASS6=(DIVIATE/DEFIATE/DIVIATION/DEVIATION/DEVEAT-)

             ..
00207       &IF(CLASS2)GOTOA

             .
00208       &IF(CLASS3)GOTOB

             .
00209       &IF(CLASS4)GOTOC

             .
00210       &IF(CLASS5)GOTOD

             .
00211       &IF(CLASS6)GOTOE

             .
00212       &IF(CLASS1)GOTOF

             .
00213       &UN

             .
00214       &ERASE12- 31
                                                      11
                                                      12
```

BEST COPY AVAILABLE

```
                                                 13
        .
00215   &SKIP 14                                 14  -
00216                                            15  I'M SYMPATHETIC WITH THE FACT THAT THIS
                                                 16                               -
00217                                            17  IS A NEW VOCABULARY FOR YOU. BUT, YOU
                                                 18
00218                                            19  CAN SEE THAT IN ORDER TO MAKE USE OF THE
                                                 20
00219                                            21  NORMAL CURVE MODEL IN DESCRIBING
                                                 22
00220                                            23  CHILDREN'S BEHAVIOR AND POTENTIAL, IT
                                                 24
00221                                            25  WOULD BE NECESSARY TO HAVE SOME SORT OF
                                                 26                         -
00222                                            27  UNIT OF MEASUREMENT. IN THIS CASE WE
                                                 28
00223                                            29  ARBITRARILY DEFINE THE UNIT AS THE
                                                 30                    -    .
00224                                            31  NORMAL DEVIATE. TYPE. DEVIATE.
        .
00225   &REPEAT
        .
00226   &LABEL. A
        .
00227   &ERASE12- 31
                                                 ****************************************************
        .
00228   &SKIP 12                                 12  -   -
00229                                            13  NO. WHAT DOES IT MEAN TO BE SEPARATED
                                                 14                                     .
00230                                            15  FROM A BASE OR REFERENCE POINT.
        .
00231   &REPEAT
        .
00232   &LABEL. B
        .
00233   &ERASE12- 31
                                                 ****************************************************
        .
00234   &SKIP 12                                 12  -   -
00235                                            13  NO. YOU WERE PROBABLY THINKING OF THE
                                                 14
00236                                            15  LOCATION OF FREQUENCIES AT VARIOUS
                                                 16                                    -
00237                                            17  POINTS IN THE NORMAL CURVE MODEL. THE
                                                 18                 BBBBBBB.......
00238                                            19  NORMAL DEVIATE          ------- ON THE OTHER HAND IS
                                                 20
00239                                            21  AN ARBITRARY BUT UNIFORM UNIT OF
                                                 22
00240                                            23  DISTANCE ON THE HORIZONTAL SCALE GOING
                                                 24                               -
```

```
00241                                  25  BOTH DIRECTIONS FROM ZERO. TYPE
                                       26
00242                                  27  DEVIATE.
          .
00243     &REPEAT
          .
00244     &LABEL. C
          .
00245     &ERASE12- 31
                                        ****************************************************

          .
00246     &SKIP 12                     12  -                            -
 0247                                  13  YOU'VE GOT THE RIGHT IDEA. BECAUSE
                                       14
00248                                  15  THE CENTER OF THE NORMAL CURVE IS THE
                                       16
00249                                  17  REFERENCE POINT THE UNIT OF DISTANCE
                                       18
00250                                  19  ON THE BASELINE IS CALLED THE NORMAL
                                       20          -                   CN.......
00251                                  21  DEVIATE. TYPE DEVIATE AND ENTER.  -------
          .
00252     &REPEAT
          .
00253     &LABEL. D
          .
00254     &ERASE12- 31
                                        ****************************************************

          .
00255     &SKIP 14                     14  -
00256                                  15  MEAN OR MEDIAN IDENTIFIES THE CENTRAL
                                       16
00257                                  17  POINT OF THE NORMAL CURVE WHERE THE
                                       18                                        -
00258                                  19  FREQUENCIES ARE THE MOST NUMEROUS. OUR
                                       20
00259                                  21  CONCERN HERE IS WITH A UNIT FOR MEASURE-
                                       22
00260                                  23  ING DISTANCE ON THE HORIZONTAL SCALE
                                       24                            BDJBBEB.......
00261                                  25  CALLED THE NORMAL DEVIATE        -------.
                                       26  -
00262                                  27  TYPE DEVIATE.
          .
00263     &REPEAT
          .
00264     &LABEL. E
          .
00265     &ERASE12- 31
                                        ****************************************************
```

BEST COPY AVAILABLE

```
00266     &SKIP 14                       14  -
00267                                    15  THE ANSWER YOU TYPED IS ESSENTIALLY
                                         16           -
00268                                    17  CORRECT. BUT WHEN REFERRING TO A
                                         18                                 BBBBBBB.......
00269                                    19  HYPOTHETICAL NORMAL CURVE, DEVIATE        ------- IS
                                         20
00270                                    21  THE MORE APPROPRIATE TERM.
          .
00271     &REPEAT
          .
00272     &LABEL. F
          .
00273     &ERASE12- 31
                                           *************************************************

          .
00274     &SKIP 14                       14  -           -
00275                                    15  THAT'S RIGHT. IT'S AN ARBITRARY MEASURE
                                         16
00276                                    17  OF DISTANCE AWAY FROM THE MEAN.
          .
00277     &GOTO NEXT
```

```
STATEMENT     TACL               TACL                    1         2         3
NUMBER        OPCODES             AA           0123456789012345678901234567890123456789   FRAME NO.    12

              .
00278         &FRAME
              .
00279         &KEYBOARD                    00
                                           01
                                           02
                                           03
                                           04  -
00280                                      05  LET US REVIEW SOME OF THE IMPORTANT
                                           06
                                           07
                                           08
00281                                      09  CHARACTERISTICS OF THE CURVE SHOWING
                                           10
                                           11
                                           12
00282                                      13  ON THE PROJECTOR.
                                           14
                                           15
                                           16       -
00283                                      17    1. THE VERTICAL DIMENSION
                                           18
00284                                      19       REPRESENTS NUMBER OF CASES
                                           20         .
00285                                      21       OR &
              .           .
00286         & CLASS1=(FREQUENCY/OBSERVATION)
              .
00287         & CLASS2=(HISTOGRAM)
              .        .     .     .      .      .
00288         & CLASS3=(BOY/INDIV/PEOP/CHILD/PERSON/PUPIL)
              .         .
00289         & CLASS4=(EIGHT/8)
              .                .
00290         & CLASS5=(YEAROLD/YROLD)
              .               .       .
00291         & CLASS6=(UNIT/NUMBER/SUBJECT)
              .
00292         &IF(CLASS1&CLASS2)GOTOG
              .
00293         &IF(CLASS1&CLASS3)GOTOG
              .
00294         &IF(CLASS1&CLASS4)GOTOG
              .
00295         &IF(CLASS1&CLASS5)GOTOG
              .
00296         &IF(CLASS1&CLASS6)GOTOG
```

```
00297                                         23. IF(CLASS2)GOTOA,IF(CLASS3)GOTOB,IF(CLASS
          .
00298     &IF(CLASS2)GOTOA
          .
00299     &IF(CLASS3)GOTOB
          .
00300     &IF(CLASS4&CLASS5)GOTOC
          .
00301     &IF(CLASS6)GOTOD
          .             .     .          .          .
00302     & CLASS6=(VARIAB/INCH/HEIGHT/DEVIATION/INTERVAL)
          .
00303     &IF(CLASS1&CLASS6)GOTOG
          .
00304     &IF(CLASS6)GOTOE
          .
00305     &IF(CLASS1)GOTOF
          .
00306     &UN
          .
00307     &ERASE22- 31
                                              24
                                              25
                                              26
                                              27

          .
00308     &SKIP 28                            28  -                 -
00309                                         29  THE WORD STARTS WITH I.
          .
00310     &REPEAT
          .
00311     &UN
          .
00312     &ERASE22- 31
                                                ************************************************

          .
00313     &SKIP 28                            28  -     -         3HGGGBP H..........
00314                                         29  TYPE FREQUENCY            ----------.
          .
00315     &REPEAT
          .
00316     &LABEL. A
          .
00317     &ERASE22- 31
                                                ************************************************
```

BEST COPY AVAILABLE

```
      •
      &SKIP 28                           28  -   -
                                         29  NO. THINK AND TRY AGAIN.
      •
      &REPEAT
      •
      &LABEL. B
      •
      &ERASE22- 31
                                            **************************************************

      •
      &SKIP 22                           22  -
                                         23  YOU GAVE A GOOD HUMANISTIC RESPONSE, BUT
                                         24
                                         25  SOMETIMES WE GATHER DATA ABOUT OBJECTS,
                                         26                     -
                                         27  ANIMALS OR EVENTS. THE MORE GENERAL
                                         28
                                         29  TERM IS FREQUENCY.
      •
      &GOTO NEXT
      •
      &LABEL. C
      •
      &ERASE22- 31
                                            **************************************************

      •
      &SKIP 22                           22  -                   •          •
                                         23  WHEN YOU ANSWERED '8 YEAR OLDS' YOU GAVE
                                         24
                                         25  A GOOD HUMANISTIC RESPONSE, BUT SOME-
                                         26
                                         27  TIMES WE GATHER DATA ABOUT OBJECTS,
                                         28                     -
                                         29  ANIMALS OR EVENTS. THE MORE GENERAL TERM
                                         30      •         •
                                         31  IS 'FREQUENCY'.
      •
      &GOTO NEXT
      •
      &LABEL. D
      •
      &ERASE22- 31
                                            **************************************************

      •
      &SKIP 22                           22  -
                                         23  YOU GAVE A SATISFACTORY GENERAL
                                         24                 -
                                         25  RESPONSE. IN EDUCATIONAL MEASUREMENT THE
                                         26
```

```
00343                               27  TECHNICAL TERM IS FREQUENCY.
         .
00344    &REPEAT
         .
00345    &LABEL. E
         .
00346    &ERASE22- 31
                                        ****************************************************

         .
00347    &SKIP 22                   22  -
00348                               23  YOU GAVE A RESPONSE ASSOCIATED WITH
                                    24
00349                               25  THE HORIZONTAL DIMENSION OF THE FIGURE
                                    26
00350                               27  INSTEAD OF THE VERTICAL. THE VERTICAL
                                    28
00351                               29  DIMENSION REPRESENTS FREQUENCY OF
                                    30                  -     .
00352                               31  OCCURRENCES. TYPE. FREQUENCY.
         .
00353    &REPEAT
         .
00354    &LABEL. F
         .
00355    &ERASE22- 31
                                        ****************************************************

         .
00356    &SKIP 28                   28  -         .
00357                               29  CORRECT!
         .
00358    &GOTO NEXT
         .
00359    &LABEL. G
         .
00360    &ERASE22- 31
                                        ****************************************************

         .
00361    &SKIP 22                   22  -
00362                               23  I GET THE FEELING THAT YOU ARE GUESSING
                                    24
00363                               25  SINCE YOU TYPED AT LEAST TWO POSSIBLE
                                    26                                   -
00364                               27  ANSWERS. SIMPLIFY YOUR ANSWER AND
                                    28
00365                               29  TRY AGAIN.
         .
00366    &REPEAT
```

```
STATEMENT      TACL                  TACL                       1         2         3
NUMBER         OPCODES                AA              0123456789012345678901234567890123456789   FRAME NO.   13

               .
00367         &FRAME*

               .
00368         &KEYBOARD

               .
00369         & NWA=0                           00
                                                01
                                                02      -
00370                                           03      LET US REVIEW SOME OF THE IMPORTANT
                                                04
                                                05
00371                                           06 CHARACTERISTICS OF THE CURVE SHOWING
                                                07
                                                08
00372                                           09 IN THE PROJECTOR.
                                                10
                                                11        -
00373                                           12        3. THE CASES TEND TO PILE UP IN THE
                                                13
                                                14
                                                15          .
00374                                           16          &          AND [illegible] RELATIVELY
                                                17
                                                18
00375                                           19           FEW AT THE EXTREMES.
               .               .
00376         & CLASS1=(CENTER/MIDDLE)

               .              .
00377         & CLASS2=(MODE/MEAN)

               .
00378         & CLASS3=(END)

               .
00379         &IF(CLASS2)GOTOA

               .
00380         &IF(CLASS3)GOTOB

               .
00381         &IF(CLASS1)GOTOC

               .
00382         &UN

               .
00383         &ERASE20- 31

               .
00384         & NWA=NWA+1

               .
00385         &IF(NWA.GE.3)GOTOD                20
                                                21
```

BEST COPY AVAILABLE

```
                                              22
                                              23
                                              24
                                              25
               .
00386        &SKIP 26                         26  -             -
00387                                         27  I'M SORRY I DIDN'T RECOGNIZE YOUR
                                              28            -
00388                                         29  ANSWER. REPHRASE IT AND TRY AGAIN.
               .
00389        &REPEAT
               .
00390        &UN
               .
00391        & NWA=NWA+1
               .
00392        &IF(NWA.GE.3)GOTOD
               .
00393        &ERASE20- 31
                                                 ****************************************************
               .
00394        &SKIP 26                         26  -
00395                                         27  I STILL DON'T RECOGNIZE YOUR ANSWER.
                                              28  -
00396                                         29  PLEASE TRY AGAIN.
               .
00397        &REPEAT
               .
00398        &LABEL. A
               .
00399        &ERASE20- 31
               .
00400        & NWA=NWA+1
               .
00401        &IF(NWA.GE.3)GOTOD
                                                 ****************************************************
               .
00402        &SKIP 24                         24  -
00403                                         25  YOU HAVE IDENTIFIED A DESCRIPTIVE STAT-
                                              26                                       -
00404                                         27  ISTIC FOR FREQUENCY DISTRIBUTIONS. IN
                                              28
00405                                         29  WHAT PART OF THE DISTRIBUTION IS THIS
                                              30                 .
00406                                         31  STATISTIC LOCATED?
               .
00407        &REPEAT
               .
```

```
00408    &LABEL. B
         .
00409    &ERASE20- 31
         .
00410    & NWA=NWA+1
         .
00411    &IF(NWA.GE.3)GOTOD
                                          ****************************************************

         .
00412    &SKIP 24                         24  -    -
00413                                     25  NO. CENTER OR MIDDLE IS CORRECT.
         .
00414    &REPEAT
         .
00415    &LABEL. C
         .
00416    &ERASE20- 31
                                          26
                                          27

         .
00417    &SKIP 28                         28  -        .
00418                                     29  FIRST RATE!
         .
00419    &GOTO NEXT
         .
00420    &LABEL. D
         .
00421    &ERASE20- 31
                                          ****************************************************

         .
00422    &SKIP 20                         20  -
00423                                     21  YOU SEEM TO EITHER BE PLAYING GAMES WITH
                                          22
00424                                     23  THE COMPUTER OR YOU ARE HAVING TROUBLE.
                                          24  -
00425                                     25  SINCE YOUR LAST THREE ANSWERS WERE
                                          26
00426                                     27  INCORRECT, ASK THE PROCTOR FOR
                                          28
00427                                     29  ASSISTANCE.
         .
00428    &PAUSE
```

```
STATEMENT      TACL              TACL                     1         2         3
NUMBER         OPCODES           AA              0123456789012345678901234567890123456789   FRAME NO.   14

               .
00429          &FRAME
               .    ..BK
00430          &EDIT.&
               .
00431          &KEYBOARD
                                           00
                                           01
                                           02
                                           03
               .
00432          &SKIP 04                    04   -                    --
00433                                      05    WHAT WOULD A CHILD'S MA BE IF HE
                                           06
                                           07                              --  .
00434                                      08  WERE 4 YEARS OLD AND HAD AN IQ OF 75?
                                           09
               .
00435          &SKIP 10                    10                 --   -- . --BBBBBBB.......
00436                                      11                 MA = CA X IQ       -------
                                           12
00437                                      13                       100
               .        .   .
00438          & CLASS1=(63/4/6-9/6.75)
               .
00439          & CLASS2=(6)
               .
00440          &IF(CLASS1)GOTOC
               .
00441          &IF(CLASS2)GOTOW
               .
00442          &UN
               .
00443          &ERASE20- 31
                                           14
                                           15
                                           16
                                           17
                                           18
                                           19
               .
00444          &SKIP 20                    20  -
00445                                      21  SUBSTITUTE THE NUMBERS INTO THE FORMULA.
                                           22  -
00446                                      23  MULTIPLY THE TOP 2 NUMBERS TOGETHER AND
                                           24
```

```
00447                                 25  DIVIDE BY THE BOTTOM NUMBER.
             .
00448        &REPEAT
             .
00449        &UN
             .
00450        &ERASE20-- 31
                                          ****************************************************

             .
00451        &SKIP 20                     20  -
00452                                     21  THE ANSWER IS 0.75.
             .
00453        &GOTO NEXT
             .
00454        &LABEL. W
             .
00455        &ERASE20- 31
                                          ****************************************************

             .
00456        &SKIP 20                     20  -
00457                                     21  DON'T DROP THE FRACTION YOU HAVE LEFT
                                          22
00458                                     23  AFTER YOU DIVIDE. WHAT IS YOUR ANSWER?
             .
00459        &REPEAT
             .
00460        &LABEL. C
             .
00461        &ERASE20- 31
                                          ****************************************************

             .
00462        &SKIP 20                     20  -      -
00463                                     21  RIGHT - NOW YOU KNOW A SIMPLER WAY OF
                                          22
00464                                     23  COMPUTING MENTAL AGE.
             .
00465        &GOTO NEXT
             .
00466        &END
```

APPENDIX B

```
                         OPTIONS SPECIFIED

                               LIST

                             10/22/74

              COURSE AUTHG-0       PACK 5          SPACING  1

                     STARTING LOCATION -- BEGINNING OF COURSE

                       ENDING LOCATION -- END OF COURSE A  A

SPECIAL FEATURES SELECTED --
                          NONE

  1  AUTHO
  2  AA01
  3        1      PR   *E
  4        2      DTI  30,36+/2,30+/4,36+/+S+P*E
  5        3      EPI  30,38+/2,30+/1,39+/+/1+/*E
  6        4      PR   *E
  7        5      DE   0+/32*E
  8        6      DTI  30,29+/2,30+/6,29+/AA01        *E
  9        7      DTI  16,15+/2,16+/9,15+/(C)HAPTER 7*E
 10        8      PA   20*E
 11        9      DTI  20,3+/2,20+/36,3+/(I)NDIVIDUAL (D)IFFERENCES AND (N)ORMALITY*E
 12  AA02
 13        1      PR   *E
 14        2      DTI  30,36+/2,30+/4,36+/+S+P*E
 15        3      EPI  30,38+/2,30+/1,39+/+/1+/*E
 16        4      PR   *E
 17        5      DE   0+/32*E
 18        6      DTI  30,29+/2,30+/6,29+/AA02        *E
 19        7      DTI  2,2+/2,2+/37,2+/(S)UPPOSE WE ARE INTERESTED IN STUDYING*E
 20        8      DTI  5,0+/2,5+/32,0+/THE HEIGHT OF THE EIGHT-YEAR-OLD*E
 21        9      DTI  8,0+/2,8+/26,0+/CHILDREN IN OUR HOME TOWN.*E
 22       10      DTI  11,2+/2,11+/29,2+/(O)NE OF THE QUESTIONS WE WOULD*E
 23       11      DTI  14,0+/2,14+/38,0+/PROBABLY WANT TO ASK IS, (*H)OW TALL ARE*E
 24       12      DTI  17,0+/2,17+/37,0+/MOST OF THE EIGHT-YEAR-OLD CHILDREN(/*E
 25       13      DTI  20,2+/2,20+/34,2+/(T)HE MOST DIRECT WAY OF FINDING THE*E
 26       14      DTI  23,0+/2,23+/38,0+/ANSWER TO THE QUESTION IS BY MEASURING*E
 27       15      DTI  26,0+/2,26+/34,0+/EACH CHILD AND RECORDING THE DATA.*E
 28  AA03
 29        1      PR   *E
 30        2      DTI  30,36+/2,30+/4,36+/+S+P*E
 31        3      EPI  30,38+/2,30+/1,39+/+/1+/*E
 32        4      PR   *E
 33        5      DE   0+/32*E
 34        6      DTI  30,29+/2,30+/6,29+/AA03        *E
 35        7      DTI  6,4+/2,6+/28,4+/(P)LEASE PUT ON YOUR EARPHONES*E
 36        8      DTI  9,4+/2,9+/28,4+/AND THEN PRESS THE SPACE BAR*E
 37        9      DTI  12,4+/2,12+/19,4+/WHEN YOU ARE READY.*E
 38       10      DTI  30,36+/2,30+/4,36+/+S+P*E
 39       11      EPI  30,38+/2,30+/1,39+/+/1+/*E
 40       12      AA   (8+/)77*E
 41       13      DTI  30,36+/2,30+/4,36+/   *E
 42       14      EPI  351*E
 43       15      DE   0+/30*E
 44       16      DTI  30,0+/2,30+/28,0+/*E
 45       17      DTI  30,39+/2,30+/1,39+/(A*E
 46       18      FN   PSREDV+/  +/C(=)01,004L+,02+,T(-)4+21+/C(=)01,005L+,04+,T(=1541L*E
 47       19      ADP  AA1*E74s,0+/36*E
 48     20      DTI 30,39+/2,30+/1,39+/*E
 49     21      DTI 0,1+/2,0+/4,1+/(N )13*E
 50     22      DTI 2,1+/2,2+/4,1+/(U )12*E
 51     23      DTI 4,1+/2,4+/4,1+/(M )11*E
 52     24      DTI 6,1+/2,6+/4,1+/(B )10*E
 53     25      DTI 8,1+/2,8+/4,1+/(E  )9*E
 54     26      DTI 10,1+/2,10+/4,1+/(R  )8*E
 55     27      DTI 12,1+/2,12+/5,1+/*IUF *R7*E
 56     28      DTI 14,1+/2,14+/5,1+/*ROF*1 6*E
 57     29      DTI 16,1+/2,16+/4,1+/(C  )5*E
 58     30      DTI 18,1+/2,18+/4,1+/(H  )4*E
 59     31      DTI 20,1+/2,20+/4,1+/(I  )3*E
 60     32      DTI 22,1+/2,22+/4,1+/(L  )2*E
 61     33      DTI 24,1+/2,24+/4,1+/(D  )1*E
 62     34      DTI 26,1+/2,26+/36,1+/(R   +4+6 +4+7 +4+8 +4+9 +5+0 +5+1 +5+2 +5+3 +5+4 +5+5 +5+6*E
 63     35      DTI 28,1+/2,28+/1,1+/(E*E
 64     36      DTI 30,1+/2,30+/27,1+/(N           H)EIGHT IN INCHES*E
 65     37      DTI 30,39+/2,30+/1,39+/(A*E
 66     38      FN  PSREMV+/  +/C(=)01,006L+,02+,T(=)543L*E
 67     39      AUP ,0+/84*E
 68     40      AC  C54+/C53*E
 69     41      DTI 30,39+/2,30+/1,39+/*E
 70     42      DTI 24,1+/2,24+/21,1+/(D  )1                (J"*E
 71     43      DTI 30,39+/2,30+/1,39+/(A*E
 72     44      F.  PSREMV+/  +/C(=)01,004L+,02+,T(=)492L+/C(=)01,005L+,04+,T(=)541L*E
 73     45      AUP AA2*E*E
 74     46      DTI 30,39+/2,30+/1,39+/*E
 75  AA04
 76      1      PR  *E
 77      2      DTI 30,36+/2,30+/4,36+/+S+P*E
 78      3      EPI 30,38+/2,30+/1,39+/+/1+/*E
 79      4      PR  *E
 80      5      DE  0+/32*E
 81      6      DTI 30,29+/2,30+/6,29+/AA04      *E
 82      7      DTI 0,1+/2,0+/33,1+/(W)HAT CHARACTERISTICS OF THE MODEL*E
 83      8      DTI 2,0+/2,2+/38,0+/DICTATES THAT THE MEAN, MEDIAN OR 50TH*E
 84      9      DTI 4,0+/2,4+/24,0+/PERCENT POINT COINCIDES(/*E
 85     10      DTI 8,1+/2,8+/35,1+/+A (H)IGH FREQUENCIES IN THE CENTER OF*E
 86     11      DTI 10,3+/2,10+/12,3+/DISTRIBUTION*E
 87     12      DTI 13,1+/2,13+/32,1+/+B (L)ONG TAILS OF THE DISTRIBUTION*E
 88     13      DTI 16,1+/2,16+/36,1+/+C (T)HE FACT THAT THE CURVE APPROACHES*E
 89     14      DTI 18,3+/2,18+/31,3+/BUT NEVER REACHES THE BASE LINE*E
 90     15      DTI 21,1+/2,21+/38,1+/+D (T)HE SYMMETRICAL QUALITY OF THE MODEL*E
 91     16      DTI 23,3+/2,23+/18,3+/OR FREQUENCY CURVE*E
 92  AA05
 93      1      PR  *E
 94      2      DTI 30,36+/2,30+/4,36+/+S+P*E
 95      3      EPI 30,38+/2,30+/1,39+/+/1+/*E
 96      4      PR  *E
 97      5      DE  0+/32*E
 98      6      DTI 30,29+/2,30+/6,29+/AA05      *E
 99      7      DTI 5,2+/2,5+/33,2+/(T)HE PURPOSE OF THIS EXAMPLE IS TO*E
100      8      DTI 7,0+/2,7+/35,0+/DEMONSTRATE THE USE OF THE KEYBOARD*E
101      9      DTI 9,0+/2,9+/33,0+/INSTRUCTION. (I)F A CURSOR DOES NOT*E
102     10      DTI 11,0+/2,11+/34,0+/APPEAR WITHIN THE TEXT, THE CURSOR*E
103     11      DTI 13,0+/2,13+/38,0+/WILL APPEAR ON THE NEXT AVAILABLE LINE*E
104     12      DTI 15,0+/2,15+/35,0+/OF THE (CRT )AFTER ALL OF THE TEXT IS*E
105     13      DTI 17,0+/2,17+/18,0+/PLACED ON THE (CRT).*E
106     14      DTI 21,2+/2,21+/35,2+/(W)HERE WILL THE CURSOR APPEAR WITHIN*E
```

```
107      15        DII 23,0+/2,23+/11,0+/THIS FRAME(/*E
108  AA06
109       1        PR  *E
110       2        DII 30,36+/2,30+/4,36+/+S+P*E
111       3        EPI 30,38+/2,30+/1,39+/+/1+/*E
112       4        PR  *E
113       5        DE  0+/32*E
114       6        DII 30,29+/2,30+/6,29+/AA06      *E
115       7        DII 2,2+/2,2+/35,2+/(L)ET US REVIEW SOME OF THE IMPORTANT*E
116       8        DII 6,0+/2,6+/36,0+/CHARACTERISTICS OF THE CURVE SHOWING*E
117       9        DII 10,0+/2,10+/17,0+/ON THE PROJECTOR.*E
118      10        DII 14,5+/2,14+/25,5+/1. (T)HE VERTICAL DIMENSION*E
119      11        DII 16,8+/2,16+/26,8+/REPRESENTS NUMBER OF CASES*E
120      12        DII 18,8+/2,18+/4,8+/OR +&*E
121  AA07
122       1        PR  *E
123       2        DII 30,36+/2,30+/4,36+/+S+P*E
124       3        EPI 30,38+/2,30+/1,39+/+/1+/*E
125       4        PR  *E
126       5        DE  0+/32*E
127       6        DII 30,29+/2,30+/6,29+/AA07      *E
128       7        DII 0,3+/2,0+/27,3+/(T)HUS IF A CHILD HAS A SCORE*E
129       8        DII 3,0+/2,3+/36,0+/OF 80 ON A TEST, AND THE MEAN OF THE*E
130       9        DII 6,0+/2,6+/40,0+/TEST IS 60, THEN HE DEVIATES +&     POINTS*E
131      10        DII 9,0+/2,9+/15,0+/ABOVE THE MEAN.*E
132  AA08
133       1        PR  *E
134       2        DII 30,36+/2,30+/4,36+/+S+P*E
135       3        EPI 30,38+/2,30+/1,39+/+/1+/*E
136       4        PR  *E
137       5        DE  0+/32*E
138       6        DII 30,29+/2,30+/6,29+/AA08      *E
139       7        DII 0,1+/2,0+/32,1+/(W)HAT CHARACTERISTIC OF THE MODEL*E
140       8        DII 2,0+/2,2+/38,0+/DICTATES THAT THE MEAN, MEDIAN OR 50TH*E
141       9        DII 4,0+/2,4+/24,0+/PERCENT POINT COINCIDES(/*E
142      10        DII 8,1+/2,8+/35,1+/+A (H)IGH FREQUENCIES IN THE CENTER OF*E
143      11        DII 10,3+/2,10+/12,3+/DISTRIBUTION*E
144      12        DII 13,1+/2,13+/32,1+/+B (L)ONG TAILS OF THE DISTRIBUTION*E
145      13        DII 16,1+/2,16+/36,1+/+C (T)HE FACT THAT THE CURVE APPROACHES*E
146      14        DII 18,3+/2,18+/31,3+/BUT NEVER REACHES THE BASE LINE*E
147      15        DII 21,1+/2,21+/38,1+/+D (T)HE SYMMETRICAL QUALITY OF THE MODEL*E
148      16        DII 23,3+/2,23+/18,3+/OR FREQUENCY CURVE*E
149      17        EPP +/ AA08 A    *E
150      18        AAP 4,7,3,0+/AA*E
151      19        BR  AA08A*E
152      20        AAP 4,12,3,0+/AB*E
153      21        BR  AA08B*E
154      22        AAP 4,15,3,0+/AC*E
155      23        BR  AA08C*E
156      24        AAP 4,20,3,0+/AD*E
157      25        BR  AA08D*E
158      26        UN  UA*E
159      27        DE  26+/4*E
160      28        DII 30,0+/2,30+/28,0+/*E
161      29        DII 28,1+/2,28+/19,1+/(T)OUCH YOUR PEN TO A*E
162      30        DII 30,0+/2,30+/12,0+/LIGHTED BOX.*E
163      31        BR  RE*E
164      32        SA  *E
165  AA08A
```

```
166        1      DE  26+/4*E
167        2      DII 30,0+/2,30+/28,0+/*E
168        3      DII 26,0+/2,26+/37,0+/(N)O. (F)REQUENCY CURVES HIGH ON THE ENDS*E
169        4      DII 28,0+/2,28+/36,0+/AND LOW IN THE MIDDLE COULD QUALIFY.*E
170        5      DII 30,0+/2,30+/10,0+/(T)RY AGAIN.*E
171        6      BR  RE*E
172   AA08B
173        1      DE  26+/4*E
174        2      DII 30,0+/2,30+/28,0+/*E
175        3      DII 26,0+/2,26+/37,0+/(F)REQUENCY DISTRIBUTIONS WITHOUT TAILS*E
176        4      DII 28,0+/2,28+/40,0+/COULD HAVE THE SAME CENTER POINT CHARAC-*E
177        5      DII 30,0+/2,30+/28,0+/TERISTICS AS OUR MODEL. (T)RY AGAIN.*E
178        6      BR  RE*E
179   AA08C
180        1      DE  26+/4*E
181        2      DII 30,0+/2,30+/28,0+/*E
182        3      DII 26,0+/2,26+/39,0+/(N)O. (T)HIS CHARACTERISTIC WOULDN'T AFFECT*E
183        4      DII 28,0+/2,28+/32,0+/THE CENTRAL TENDENCY. (T)RY AGAIN.*E
184        5      BR  RE*E
185   AA08D
186        1      DE  26+/4*E
187        2      DII 30,0+/2,30+/28,0+/*E
188        3      DII 26,0+/2,26+/37,0+/(R)IGHT. (T)HE SYMMETRICAL QUALITY OF THE*E
189        4      DII 28,0+/2,28+/35,0+/MODEL MAKES THE CENTRAL DESCRIPTORS*E
190        5      DII 30,0+/2,30+/9,0+/COINCIDE.*E
191        6      BR  AA09*E
192   AA09
193        1      PR  *E
194        2      DII 30,36+/2,30+/4,36+/+S+P*E
195        3      EPI 30,38+/2,30+/1,39+/+/1+/*E
196        4      PR  *E
197        5      DE  0+/32*E
198        6      DII 30,29+/2,30+/6,29+/AA09      *E
199        7      EPI 513*E
200        8      DII 4,3+/2,4+/35,3+/(L)OOK AT THE IMAGE CAREFULLY. (I)S THE*E
201        9      DII 7,0+/2,7+/40,0+/SPACE UNDER THE CURVE BOUNDED BY -3*I(.*0 )AND*E
202       10      DII 10,0+/2,10+/39,0+/-1*I(.*0), THE SAME AS THE SPACE BOUNDED BY*E
203       11      DII 13,0+/2,13+/32,0+/-2*I(.*0), AND 0(/  T)YPE YES*B*B*B(--- )OR NO*B*B(--). *E*E
204       12      EPI 13,29+/2,13+/11,29+/+/11+/ AA09 A    *E
205       13      FN  ED+/+/,C+/+/ +/,+/.+/(S+/)-+/(L+/)L+/(/+/)/+/*R+/*I+/*R+/*C*E
206       14      AA  YES+/AA*E
207       15      BR  AA09Y*E
208       16      AA  NO+/AB*E
209       17      BR  AA09N*E
210       18      UN  UA*E
211       19      DII 28,0+/2,28+/38,0+/(T)HE ANSWER IS NO. (T)HE AREAS DO DIFFER.*E
212       20      FN  ANS+/3+/T+/(8+/)UA*E
213       21      BR  AA10*E
214   AA09N
215        1      DII 28,0+/2,28+/39,0+/(T)HAT'S RIGHT. (T)HE AREAS UNDER THE CURVE*E
216        2      DII 30,0+/2,30+/10,0+/DO DIFFER.*E
217        3      BR  AA10*E
218   AA09Y
219        1      DII 26,0+/2,26+/40,0+/(N)OT QUITE. (A)LTHOUGH BANDS ARE 2*I(.*0)'S WIDE*E
220        2      DII 28,0+/2,28+/39,0+/THEIR AREA DIFFERS BECAUSE OF DIFFERENT*E
221        3      DII 30,0+/2,30+/28,0+/RELATIONSHIPS AT THE ZERO POINT.*E
222        4      BR  AA10*E
223   AA10
224        1      PR  *E
```

```
       2        DTI 30,36+/2,30+/4,36+/+S+P*E
       3        EPI 30,38+/2,30+/1,39+/+/1+/*E
       4        PRR *E
       5        BR  UN+/S31+/1*E
       6        DE  0+/32*E
       7        DTI 30,29+/2,30+/6,29+/AA10      *E
       8        DTI 1,4+/2,1+/30,4+/(F)OR PHYSICAL VARIABLES SUCH AS*E
       9        DTI 4,4+/2,4+/31,4+/HEIGHT WE USE CHRONOLOGICAL AGE*E
      10        DTI 7,4+/2,7+/30,4+/AS A BASE LINE FOR COMPARISON.*E
      11        DTI 10,4+/2,10+/31,4+/(C)HRONOLOGICAL AGE REFERS TO THE*E
      12        DTI 13,4+/2,13+/33,4+/NUMBER OF YEARS, MONTHS, AND DAYS*E
      13        DTI 16,4+/2,16+/19,4+/A PERSON HAS LIVED.*E
      14        DTI 19,4+/2,19+/32,4+/(W)E USUALLY COMPARE CHILDREN WITH*E
      15        DTI 22,4+/2,22+/18,4+/OTHERS THEIR OWN +&*E
      16        EPI 22,21+/2,22+/19,21+/+/19+/ AA10 A    *E
      17        FN  ED+/+/,G+/+/ +/,+/.+/(6+/)-+/(&+/)&+/(/+/)/+/*R+/*I+/*B+/*C*F
      18        AA  (8+/)ZZ*F
      19        LD  CHRONOLOGICALAGE CA +/B1*F
      20        FN2 COD+/1,1*F
      21        FN2 SQ+/AA+/(99)1(=)2(00*E
      22        BR  AA10C*E
      23        AA  (8+/)ZZ*E
      24        LD  CLASS PEER  +/B1*E
      25        FN2 COD+/1,1*F
      26        FN2 SQ+/AB+/(99)1(=)2(00*F
      27        BR  AA10W*E
      28        UN  UA*E
      29        DE  28+/2*E
      30        DTI 30,0+/1,30+/28,0+/*E
      31        DTI 28,0+/2,28+/28,0+/(T)RY AGAIN. (L)OOK AT THE FIRST*E
      32        DTI 30,0+/2,30+/20,0+/SENTENCE FOR A CLUE.*E
      33        BR  RE*E
      34        UN  UB*E
      35        DE  28+/2*E
      36        DTI 30,0+/1,30+/28,0+/*E
      37        DTI 30,0+/2,30+/26,0+/(A)GE IS THE CORRECT ANSWER.*E
      38        FN  ANS+/3+/I+/(8+/)UB*E
      39        BR  AA11*E
      40        FA  *E
  AA10C
       1        DE  28+/2*E
       2        DTI 30,0+/1,30+/28,0+/*E
       3        DTI 28,0+/2,28+/21,0+/(G)OOD. (T)HAT'S CORRECT.*E
       4        BR  AA11*E
  AA10W
       1        DE  28+/2*E
       2        DTI 30,0+/1,30+/28,0+/*E
       3        DTI 28,0+/2,28+/39,0+/(B)UT, CHILDREN IN THE SAME CLASS OR PEER*E
       4        DTI 30,0+/2,30+/28,0+/GROUP ARE USUALLY ABOUT THE SAME (------).*F
       5        BR  RE*E
  AA11
       1        PR  *F
       2        DTI 30,36+/2,30+/4,36+/+S+P*E
       3        FPI 30,38+/2,30+/1,39+/+/1+/*E
       4        PR  *E
       5        DE  0+/32*E
       6        DTI 30,29+/2,30+/6,29+/AA11      *E
       7        DTI 3,2+/2,3+/34,2+/(T)HE UNIFORM HORIZONTAL DISTANCE ON*
       8        DTI 6,0+/2,6+/36,0+/THE NORMAL CURVE MODEL IS CALLED THE*
```

```
284       9        DTI 9,0+/2,9+/8,0+/NORMAL +E*F
285      10        EPI 9,7+/2,9+/33,7+/+/33+/ AA11 A    *E
286      11        FN  ED+/+/,0+/+/ +/,+/.+/(6+/)-+/(E+/)E+/(/+/)/+/*R+/*I+/*B+/*C*E
287      12        AA  (8+/)ZZ*F
288      13        LD  CURVE +/B1*F
289      14        FN2 COD+/1,1*F
290      15        FN2 SQ+/AA+/(99)1(00*E
291      16        BR  AA11A*E
292      17        AA  (8+/)ZZ*E
293      18        LD  FREQUENCYDISTRIBUTION +/B1*F
294      19        FN2 COD+/1,1*E
295      20        FN2 SQ+/AB+/(99)1(00*F
296      21        BR  AA11B*E
297      22        AA  (8+/)ZZ*E
298      23        LD  BAND RANGE SPREAD VARIABILITY DISTANCE  +/B1*E
299      24        FN2 COD+/1,1*F
300      25        FN2 SQ+/AC+/(99)1(=)2(=)3(=)4(=)5(00*E
301      26        BR  AA11C*E
302      27        AA  (8+/)ZZ*E
303      28        LD  MEAN MEDIAN +/B1*E
304      29        FN2 COD+/1,1*E
305      30        FN2 SQ+/AD+/(99)1(=)2(00*F
306      31        BR  AA11D*E
307      32        AA  (8+/)ZZ*E
308      33        LD  DIVIATE DEFIATE DIVIATION DEVIATION DEVEATE +/B1*E
309      34        FN2 COD+/1,1*E
310      35        FN2 SQ+/AE+/(99)1(=)2(=)3(=)4(=)5(00*E
311      36        BR  AA11E*E
312      37        AA  (8+/)ZZ*F
313      38        LD  DEVIATE +/B1*E
314      39        FN2 COD+/1,1*F
315      40        FN2 SQ+/AF+/(99)1(00*E
316      41        BR  AA11F*E
317      42        UN  UA*E
318      43        DE  12+/18*E
319      44        DTI 30,0+/2,30+/28,0+/*E
320      45        DTI 14,0+/2,14+/39,0+/(I)'M SYMPATHETIC WITH THE FACT THAT THIS*F
321      46        DTI 16,0+/2,16+/37,0+/IS A NEW VOCABULARY FOR YOU. (B)UT, YOU*F
322      47        DTI 18,0+/2,18+/40,0+/CAN SEE THAT IN ORDER TO MAKE USE OF THE*E
323      48        DTI 20,0+/2,20+/32,0+/NORMAL CURVE MODEL IN DESCRIBING*E
324      49        DTI 22,0+/2,22+/37,0+/CHILDREN'S BEHAVIOR AND POTENTIAL, IT*E
325      50        DTI 24,0+/2,24+/39,0+/WOULD BE NECESSARY TO HAVE SOME SORT OF*E
326      51        DTI 26,0+/2,26+/36,0+/UNIT OF MEASUREMENT. (I)N THIS CASE WE*F
327      52        DTI 28,0+/2,28+/34,0+/ARBITRARILY DEFINE THE UNIT AS THE*E
328      53        DTI 30,0+/2,30+/28,0+/NORMAL DEVIATE. (T)YPE(E )DEVIATE.*E
329      54        BR  RE*E
330      55        EA  *E
331  AA11A
332       1        DE  12+/18*E
333       2        DTI 30,0+/2,30+/28,0+/*E
334       3        DTI 12,0+/2,12+/37,0+/(N)O. (W)HAT DOES IT MEAN TO BE SEPARATED*E
335       4        DTI 14,0+/2,14+/31,0+/FROM A BASE OR REFERENCE POINT(/*E
336       5        BR  RE*E
337  AA11B
338       1        DE  12+/15*E
339       2        DTI 30,0+/2,30+/28,0+/*E
340       3        DTI 12,0+/2,12+/37,0+/(N)O. (Y)OU WERE PROBABLY THINKING OF THE*E
341       4        DTI 14,0+/2,14+/34,0+/LOCATION OF FREQUENCIES AT VARIOUS*E
342       5        DTI 16,0+/2,16+/37,0+/POINTS IN THE NORMAL CURVE MODEL. (T)HE*F
```

```
343       6       DTI 18,0+/2,18+/36,0+/NORMAL DEVIATE*B*B*B*B*B*B*B(------- )ON THE OTHER HAND IS*E
344       7       DTI 20,0+/2,20+/32,0+/AN ARBITRARY BUT UNIFORM UNIT OF*E
345       8       DTI 22,0+/2,22+/38,0+/DISTANCE ON THE HORIZONTAL SCALE GOING*E
346       9       DTI 24,0+/2,24+/31,0+/BOTH DIRECTIONS FROM ZERO. (T)YPE*E
347      10       DTI 26,0+/2,26+/8,0+/DEVIATE.*E
348      11       BR  RE*E
349  AA11C
350       1       DE  12+/18*E
351       2       DTI 30,0+/2,30+/28,0+/*E
352       3       DTI 12,0+/2,12+/34,0+/(Y)OU'VE GOT THE RIGHT IDEA. (B)ECAUSE*E
353       4       DTI 14,0+/2,14+/37,0+/THE CENTER OF THE NORMAL CURVE IS THE*E
354       5       DTI 16,0+/2,16+/36,0+/REFERENCE POINT THE UNIT OR DISTANCE*E
355       6       DTI 18,0+/2,18+/36,0+/ON THE BASELINE IS CALLED THE NORMAL*E
356       7       DTI 20,0+/2,20+/31,0+/DEVIATE. (T)YPE DEVIATE AND ENTER.*C*R(-------*E
357       8       BR  RE*E
358  AA11D
359       1       DE  12+/18*E
360       2       DTI 30,0+/2,30+/28,0+/*E
361       3       DTI 14,0+/2,14+/37,0+/(M)EAN OR MEDIAN IDENTIFIES THE CENTRAL*E
362       4       DTI 16,0+/2,16+/35,0+/POINT OF THE NORMAL CURVE WHERE THE*E
363       5       DTI 18,0+/2,18+/38,0+/FREQUENCIES ARE THE MOST NUMEROUS. (O)UR*E
364       6       DTI 20,0+/2,20+/40,0+/CONCERN HERE IS WITH A UNIT FOR MEASURE-*E
365       7       DTI 22,0+/2,22+/36,0+/ING DISTANCE ON THE HORIZONTAL SCALE*E
366       8       DTI 24,0+/2,24+/26,0+/CALLED THE NORMAL DEVIATE*B*B*B*B*B*B*B(-------).*E
367       9       DTI 26,0+/2,26+/13,0+/(T)YPE DEVIATE.*E
368      10       BR  RE*E
369  AA11E
370       1       DE  12+/18*E
371       2       DTI 30,0+/2,30+/28,0+/*E
372       3       DTI 14,0+/2,14+/35,0+/(T)HE ANSWER YOU TYPED IS ESSENTIALLY*E
373       4       DTI 16,0+/2,16+/31,0+/CORRECT. (B)UT WHEN REFERING TO A*E
374       5       DTI 18,0+/2,18+/38,0+/HYPOTHETICAL NORMAL CURVE, DEVIATE*B*B*B*B*B*B*B(------- )IS*E
375       6       DTI 20,0+/2,20+/26,0+/THE MORE APPROPRIATE TERM.*E
376       7       BR  RE*E
377  AA11F
378       1       DE  12+/18*E
379       2       DTI 30,0+/2,30+/28,0+/*E
380       3       DTI 14,0+/2,14+/39,0+/(T)HAT'S RIGHT. (I)T'S AN ARBITRARY MEASURE*E
381       4       DTI 16,0+/2,16+/31,0+/OF DISTANCE AWAY FROM THE MEAN.*E
382       5       BR  AA12*E
383  AA12
384       1       PR  *E
385       2       DTI 30,36+/2,30+/4,36+/*S*P*E
386       3       EPI 30,38+/2,30+/1,39+/*/1+/*E
387       4       PR  *E
388       5       DE  0+/32*E
389       6       DTI 30,29+/2,30+/6,29+/AA12      *E
390       7       DTI 4,0+/2,4+/35,0+/(L)ET US REVIEW SOME OF THE IMPORTANT*E
391       8       DTI 8,0+/2,8+/36,0+/CHARACTERISTICS OF THE CURVE SHOWING*E
392       9       DTI 12,0+/2,12+/17,0+/ON THE PROJECTOR.*E
393      10       DTI 16,3+/2,16+/25,3+/1. (T)HE VERTICAL DIMENSION*E
394      11       DTI 18,6+/2,18+/26,6+/REPRESENTS NUMBER OF CASES*E
395      12       DTI 20,6+/2,20+/4,6+/OR +&*E
396      13       EPI 20,9+/2,20+/31,9+/*/31+/ AA12 A    *E
397      14       FV  ED+/*/,D+/*/ +/,+/.+/(6+/)-+/(&+/)&+/(/+/)/+/*R+/*I+/*B+/*C*E
398      15       AA  (8+/)ZZ*E
399      16       LD  FREQUENCY OBSERVATION HISTOGRAM +/B1*E
400      17       FN2 CUD+/1,1*E
401      18       FN2 SQ+/AA+/(99)1(=)2(0).(9)3(00*E
402     19     BR  AA12G*E
403     20     AA  (8+/)ZZ*E
404     21     LD  FREQUENCY OBSERVATION BOY INDIV PEOP CHILD PERSON PUPIL +/B1*E
405     22     FN2 COD+/1,1*E
406     23     FN2 SQ+/AB+/(99)1(=)2(0).(9)3(=)4(=)5(=)6(=)7(=)8(00*E
407     24     BR  AA12G*E
408     25     AA  (8+/)ZZ*E
409     26     LD  FREQUENCY OBSERVATION EIGHT 8 +/B1*E
410     27     FN2 COD+/1,1*E
411     28     FN2 SQ+/AC+/(99)1(=)2(0).(9)3(=)4(00*E
412     29     BR  AA12G*E
413     30     AA  (8+/)ZZ*E
414     31     LD  FREQUENCY OBSERVATION YEAROLD YROLD +/B1*E
415     32     FN2 COD+/1,1*E
416     33     FN2 SQ+/AD+/(99)1(=)2(0).(9)3(=)4(00*E
417     34     BR  AA12G*E
418     35     AA  (8+/)ZZ*E
419     36     LD  FREQUENCY OBSERVATION UNIT NUMBER SUBJECT +/B1*E
420     37     FN2 COD+/1,1*E
421     38     FN2 SQ+/AE+/(99)1(=)2(0).(9)3(=)4(=)5(00*E
422     39     BR  AA12G*E
423     40     DII 22,0+/2,22+/40,0+/IF(9)CLASS2(0)GOTOA&IF(9)CLASS3(0)GOTOB&IF(9)CLASS*E
424     41     AA  (8+/)ZZ*E
425     42     LD  HISTOGRAM +/B1*E
426     43     FN2 COD+/1,1*E
427     44     FN2 SQ+/AF+/(99)1(00*E
428     45     BR  AA12A*E
429     46     AA  (8+/)ZZ*E
430     47     LD  BOY INDIV PEOP CHILD PERSON PUPIL +/B1*E
431     48     FN2 COD+/1,1*E
432     49     FN2 SQ+/AG+/(99)1(=)2(=)3(=)4(=)5(=)6(00*E
433     50     BR  AA12B*E
434     51     AA  (8+/)ZZ*E
435     52     LD  EIGHT 8 YEAROLD YROLD +/B1*E
436     53     FN2 COD+/1,1*E
437     54     FN2 SQ+/AH+/(99)1(=)2(0).(9)3(=)4(00*E
438     55     BR  AA12C*E
439     56     AA  (8+/)ZZ*E
440     57     LD  UNIT NUMBER SUBJECT +/B1*E
441     58     FN2 COD+/1,1*E
442     59     FN2 SQ+/AI+/(99)1(=)2(=)3(00*E
443     60     BR  AA12D*E
444     61     AA  (8+/)ZZ*E
445     62     LD  FREQUENCY OBSERVATION VARIAB INCH HEIGHT DEVIATION INTERVAL +/B1*E
446     63     FN2 COD+/1,1*E
447     64     FN2 SQ+/AJ+/(99)1(=)2(0).(9)3(=)4(=)5(=)6(=)7(00*E
448     65     BR  AA12G*E
449     66     AA  (8+/)ZZ*E
450     67     LD  VARIAB INCH HEIGHT DEVIATION INTERVAL +/B1*E
451     68     FN2 COD+/1,1*E
452     69     FN2 SQ+/AK+/(99)1(=)2(=)3(=)4(=)5(00*E
453     70     BR  AA12E*E
454     71     AA  (8+/)ZZ*E
455     72     LD  FREQUENCY OBSERVATION +/B1*E
456     73     FN2 COD+/1,1*E
457     74     FN2 SQ+/AL+/(99)1(=)2(00*E
458     75     BR  AA12F*E
459     76     UN  UA*E
460     77     DE  22+/8*E
```

```
      78    DTI 30,0+/2,30+/28,0+/*E
      79    DTI 28,0+/2,28+/23,0+/(T)HE WORD STARTS WITH (F).*E
      80    BR  RE*E
      81    UN  UB*E
      82    DE  22+/8*E
      83    DTI 30,0+/2,30+/28,0+/*E
      84    DTI 28,0+/2,28+/16,0+/(T)YPE (F)REQUENCY*B*B*B*B*B*B*B*B*B(---------).*E
      85    BR  RE*E
      86    EA  *E
AA12A
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 28,0+/2,28+/24,0+/(N)O. (T)HINK AND TRY AGAIN.*E
       4    BR  RE*E
AA12B
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 22,0+/2,22+/40,0+/(Y)OU GAVE A GOOD HUMANISTIC RESPONSE, BUT*E
       4    DTI 24,0+/2,24+/39,0+/SOMETIMES WE GATHER DATA ABOUT OBJECTS,*E
       5    DTI 26,0+/2,26+/35,0+/ANIMALS OR EVENTS. (T)HE MORE GENERAL*E
       6    DTI 28,0+/2,28+/18,0+/TERM IS FREQUENCY.*E
       7    BR  AA13*E
AA12C
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 22,0+/2,22+/40,0+/(W)HEN YOU ANSWERED (')8 YEAR OLDS(' )YOU GAVE*E
       4    DTI 24,0+/2,24+/37,0+/A GOOD HUMANISTIC RESPONSE, BUT SOME-*E
       5    DTI 26,0+/2,26+/35,0+/TIMES WE GATHER DATA ABOUT OBJECTS,*E
       6    DTI 28,0+/2,28+/40,0+/ANIMALS OR EVENTS. (T)HE MORE GENERAL TERM*E
       7    DTI 30,0+/2,30+/15,0+/IS (')FREQUENCY(').*E
       8    BR  AA13*E
AA12D
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 22,0+/2,22+/31,0+/(Y)OU GAVE A SATISFACTORY GENERAL*E
       4    DTI 24,0+/2,24+/40,0+/RESPONSE. (I)N EDUCATIONAL MEASUREMENT THE*E
       5    DTI 26,0+/2,26+/28,0+/TECHNICAL TERM IS FREQUENCY.*E
       6    BR  RE*E
AA12E
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 22,0+/2,22+/35,0+/(Y)OU GAVE A RESPONSE ASSOCIATED WITH*E
       4    DTI 24,0+/2,24+/38,0+/THE HORIZONTAL DIMENSION OF THE FIGURE*E
       5    DTI 26,0+/2,26+/37,0+/INSTEAD OF THE VERTICAL. (T)HE VERTICAL*E
       6    DTI 28,0+/2,28+/33,0+/DIMENSION REPRESENTS FREQUENCY OF*E
       7    DTI 30,0+/2,30+/27,0+/OCCURRENCES. (T)YPE(& )FREQUENCY.*E
       8    BR  RE*E
AA12F
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 28,0+/2,28+/8,0+/(C)ORRECT(6*E
       4    BR  AA13*E
AA12G
       1    DE  22+/8*E
       2    DTI 30,0+/2,30+/28,0+/*E
       3    DTI 22,0+/2,22+/39,0+/(I )GET THE FEELING THAT YOU ARE GUESSING*E
       4    DTI 24,0+/2,24+/37,0+/SINCE YOU TYPED AT LEAST TWO POSSIBLE*E
       5    DTI 26,0+/2,26+/33,0+/ANSWERS. (S)IMPLIFY YOUR ANSWER AND*E
       6    DTI 28,0+/2,28+/10,0+/TRY AGAIN.*E
```

```
520       7        BR  RE*E
521  AA13
522       1        PR  *E
523       2        DTI 30,36+/2,30+/4,36+/+S+P*E
524       3        EPI 30,38+/2,30+/1,39+/+/1+/*E
525       4        PRR *E
526       5        BR  ON+/531+/1*E
527       6        DE  0+/32*E
528       7        DTI 30,29+/2,30+/6,29+/AA13      *E
529       8        LD  0+/C30*E
530       9        DTI 2,3+/2,2+/35,3+/(L)ET US REVIEW SOME OF THE IMPORTANT*E
531      10        DTI 5,0+/2,5+/36,0+/CHARACTERISTICS OF THE CURVE SHOWING*E
532      11        DTI 8,0+/2,8+/17,0+/ON THE PROJECTOR.*E
533      12        DTI 11,5+/2,11+/35,5+/3. (T)HE CASES TEND TO PILE UP IN THE*E
534      13        DTI 15,8+/2,15+/29,8+/+&          AND TO BE RELATIVELY*E
535      14        DTI 18,8+/2,18+/20,8+/FEW AT THE EXTREMES.*E
536      15        EPI 15,8+/2,15+/8,8+/+/8+/ AA13 A    *E
537      16        FN  ED+/+/,0+/+/ +/,+/.+/(6+/)-+/(&+/)&+/(/+/)/+/*R+/*I+/*B+/*C*E
538      17        AA  (8+/)ZZ*E
539      18        LD  MODE MEAN +/B1*E
540      19        FN2 COD+/1,1*E
541      20        FN2 SQ+/AA+/(99)1(=)2(00*E
542      21        BR  AA13A*E
543      22        AA  (8+/)ZZ*E
544      23        LD  END +/B1*E
545      24        FN2 COD+/1,1*E
546      25        FN2 SQ+/AB+/(99)1(00*E
547      26        BR  AA13B*E
548      27        AA  (8+/)ZZ*E
549      28        LD  CENTER MIDDLE +/B1*E
550      29        FN2 COD+/1,1*E
551      30        FN2 SQ+/AC+/(99)1(=)2(00*E
552      31        BR  AA13C*E
553      32        UN  UA*E
554      33        DE  20+/10*E
555      34        DTI 30,0+/2,30+/28,0+/*E
556      35        AD  1+/C30*E
557      36        BR  AA13D+/C30+/GE+/3*E
558      37        DTI 26,0+/2,26+/33,0+/(I)'M SORRY (I )DIDN'T RECOGNIZE YOUR*E
559      38        DTI 28,0+/2,28+/34,0+/ANSWER. (R)EPHRASE IT AND TRY AGAIN.*E
560      39        BR  RE*E
561      40        UN  UB*E
562      41        AD  1+/C30*E
563      42        BR  AA13D+/C30+/GE+/3*E
564      43        DE  20+/10*E
565      44        DTI 30,0+/2,30+/28,0+/*E
566      45        DTI 26,0+/2,26+/36,0+/(I )STILL DON'T RECOGNIZE YOUR ANSWER.*E
567      46        DTI 28,0+/2,28+/17,0+/(P)LEASE TRY AGAIN.*E
568      47        BR  RE*E
569      48        EA  *E
570  AA13A
571       1        DE  20+/10*E
572       2        DTI 30,0+/2,30+/28,0+/*E
573       3        AD  1+/C30*E
574       4        BR  AA13D+/C30+/GE+/3*E
575       5        DTI 24,0+/2,24+/39,0+/(Y)OU HAVE IDENTIFIED A DESCRIPTIVE STAT-*E
576       6        DTI 26,0+/2,26+/37,0+/ISTIC FOR FREQUENCY DISTRIBUTIONS. (I)N*E
577       7        DTI 28,0+/2,28+/37,0+/WHAT PART OF THE DISTRIBUTION IS THIS*E
578       8        DTI 30,0+/2,30+/18,0+/STATISTIC LOCATED(/*E
579        9     BR  RE*E
580   AA13B
581        1     DE  20+/10*E
582        2     DTI 30,0+/2,30+/28,0+/*E
583        3     AD  1+/C30*F
584        4     BR  AA13D+/C30+/GE+/3*E
585        5     DTI 24,0+/2,24+/32,0+/(N)O. (C)ENTER OR MIDDLE IS CORRECT.*E
586        6     BR  RE*E
587   AA13C
588        1     DE  20+/10*E
589        2     DTI 30,0+/2,30+/28,0+/*E
590        3     DTI 28,0+/2,28+/11,0+/(F)IRST RATE(6*E
591        4     BR  AA14*E
592   AA13D
593        1     DE  20+/10*E
594        2     DTI 30,0+/2,30+/28,0+/*E
595        3     DTI 20,0+/2,20+/40,0+/(Y)OU SEEM TO EITHER BE PLAYING GAMES WITH*E
596        4     DTI 22,0+/2,22+/39,0+/THE COMPUTER OR YOU ARE HAVING TROUBLE.*E
597        5     DTI 24,0+/2,24+/34,0+/(S)INCE YOUR LAST THREE ANSWERS WERE*E
598        6     DTI 26,0+/2,26+/30,0+/INCORRECT, ASK THE PROCTOR FOR*E
599        7     DTI 28,0+/2,28+/11,0+/ASSISTANCE.*E
600        8     DTI 30,36+/2,30+/4,36+/+S+P*F
601        9     EPI 30,38+/2,30+/1,39+/+/1+/*E
602       10     AA  (8+/)ZZ*E
603       11     DTI 30,36+/2,30+/4,36+/  *E
604   AA14
605        1     PR  *E
606        2     DTI 30,36+/2,30+/4,36+/+S+P*F
607        3     EPI 30,38+/2,30+/1,39+/+/1+/*E
608        4     PR  *E
609        5     DE  0+/32*E
610        6     DTI 30,29+/2,30+/6,29+/AA14      *E
611        7     DTI 4,2+/2,4+/32,2+/(W)HAT WOULD A CHILD'S (MA )BE IF HE*E
612        8     DTI 7,0+/2,7+/37,0+/WERE 9 YEARS OLD AND HAD AN (IQ )OF 75(/*E
613        9     DTI 10,14+/2,10+/12,14+/(MA )= (CA )$ (IQ*B*B*B*B*B*B*B--------*E
614       10     DTI 12,21+/2,12+/3,21+/100*E
615       11     EP  14,0+/2,14+/40,0+/+/40+/ AA14 A    *E
616       12     FN  EC+/+/,C+/+/ +/*B+/*R*E
617       13     AA  (8+/)ZZ*F
618       14     LD  63/4 6-9 6.75 +/81*E
619       15     FN2 COD+/1,1*F
620       16     FN2 SQ+/AA+/(99)1(=)2(=)3(00*E
621       17     BR  AA14C*E
622       18     AA  (8+/)ZZ*E
623       19     LD  6 +/81*F
624       20     FN2 COD+/1,1*E
625       21     FN2 SQ+/AB+/(99)1(00*E
626       22     BR  AA14W*E
627       23     UN  UA*F
628       24     DE  20+/10*E
629       25     DTI 30,0+/2,30+/28,0+/*E
630       26     DTI 20,0+/2,20+/40,0+/(S)UBSTITUTE THE NUMBERS INTO THE FORMULA.*E
631       27     DTI 22,0+/2,22+/39,0+/(M)ULTIPLY THE TOP 2 NUMBERS TOGETHER AND*E
632       28     DTI 24,0+/2,24+/28,0+/DIVIDE BY THE BOTTOM NUMBER.*F
633       29     BR  RE*E
634       30     UN  UB*E
635       31     DE  20+/10*F
636       32     DTI 30,0+/2,30+/28,0+/*E
637       33     DTI 20,0+/2,20+/19,0+/(T)HE ANSWER IS 6.75.*F
```

```
 638       34        FN  ANS+/3+/1+/(8+/)UB*E
 639       35        BR  AA15*E
 640       36        EA  *E
 641   AA14W
 642        1        DE  20+/10*E
 643        2        DII 30,0+/2,30+/28,0+/*E
 644        3        DII 20,0+/2,20+/37,0+/(D)ON'T DROP THE FRACTION YOU HAVE LEFT*E
 645        4        DII 22,0+/2,22+/38,0+/AFTER YOU DIVIDE. (W)HAT IS YOUR ANSWER(/*E
 646        5        BR  RE*E
 647   AA14C
 648        1        DE  20+/10*E
 649        2        DII 30,0+/2,30+/28,0+/*E
 650        3        DII 20,0+/2,20+/36,0+/(R)IGHT - (N)OW YOU KNOW A SIMPLE WAY OF*E
 651        4        DII 22,0+/2,22+/21,0+/COMPUTING MENTAL AGE.*E
 652        5        BR  AA15*E
 653        6        EN  *E
```

INDEX

Adding Additional Material, 114
Alternate Coded, 15
Analyzing Student Keyboard Responses, 72
Anticipated Response, 33
Arrows, 2
Audio Messages, 8
Audio Message Program Sheet, 8, 13
Audio Unit, 5, 6
Authoring Sheets, 5, 7
Beginning a New Chapter, 91
Branching, 32
*[ ] **CANCEL**, 94
Cathode Ray Tube, 5, 6
Changing Dictionaries, 92
Chapter Identification, 90
Circle, 2
CLASS n - (----), 41
Class Statement, 41
CLEAR r, 94
Close Image, 71
CLOSE IMAGE, 71, 22
Coding Conventions, 11
Coding Sheets, 5, 7
Conditional Branches, 33, 38
Continuing Lines of Text, 92
Control of Audio, 71
Control of Audio Messages, 22
Control of Images, 22, 71
COPY n_1 - n_2/n_3, 115
Copying TACL Statements, 115
Coursewriter II Code, 87
"Crash", 124
CRT, 5, 6
Cursor Placement, 4
CW, 87
DELETE n_1, 114
DELETE n_1 - n_2, 114
Diamonds, 2
Displaying Text, 16, 64
Dot Dictionary, 64, 70
Earphones, 6, 14
EDIT, 73
EDIT: $c_1c_2c_3$...., 72
EDIT: **String $_1$ String $_2$**...., 73
Editing a Chapter, 113
Emphasis Mark, 8
END, 120
ERASE, 16
ERASE r_1 - r_2, 16
Erasing the Screen, 16
Feedback, response contingent, 56
Flowchart, 2
Flowcharting, 2
Frame, 8
FRAME, 15
FRAME*, 15
FRAME 2, 63
FRAME 2*, 63
FRAME 3, 63
Frame Identification, 15, 63
Frame Instruction, 91
Geometric Dictionary, 64, 67, 68, 69
GO TO a, 32
GO TO aaaa, 33
GO TO NEXT, 33
IBM 1500 Instructional System, 5, 6
IDENT, 79, 83
IDENT: c_1, 83
IDENT: c_1...c_4, 79
Identifying Alternate Responses, 79
Identifying Student Responses, 77
IF ("ALT 1") GO TO aaaa, 33
IF (---) GO TO aaaa, 38
IF (X.OP.Y) GO TO aaaa, 58
IF (YES*) GO TO Y, 41
Image Planning Forms, 8, 12
Image Projector, 5, 6
Improper Terminations, 124
Initialize a TACL Tape, 117
Input Card(s), TACL, 119
Inputting Program, Signing on to the, 89
Inputting TACL Instruction, 90
Inputting Text, 92
[ ] **INSERT 1**, 91
INSERT n_1, 114
Instructions, TACL
  [ ] **CANCEL**, 94
  Class n = (---), 41
  CLEAR r, 94
  CLOSE IMAGE, 22
  COPY n_1 - n_2/n_3, 115
  CW, 87
  DELETE n_1, 114
  DELETE n_1 - n_2, 114
  EDIT, 73
  EDIT $c_1c_2c_3$...., 72
  EDIT String $_1$ String $_2$...., 73
  END Record, 120
  ERASE, 16
  ERASE r_1 - r_2, 16

---

*Bold entries are TACL instructions.

FRAME, 15
FRAME*, 15
FRAME 2, 63
FRAME 2*, 63
FRAME 3, 63
GO TO a, 32
GO TO aaaa, 33
GO TO NEXT, 33
IDENT, 79, 83
IDENT: c_1, 83
IDENT: $c_1 \ldots c_4$, 79
IF ("ALT 1") GO TO aaaa, 33
IF (---) GO TO, 38
IF (X.OP.Y) GO TO Y, 58
[ ] INSERT 1, 91
INSERT n_1, 114
KEYBOARD, 28
LABEL: c, 32
LABEL: cccc, 32
LIGHT PEN, 26
Move $n_1 - n_2/n_3$, 115
PAUSE, 17
PAUSE n, 17
PLAY AUDIO, 22, 71
PLAY AUDIO nnn, 71
POSITION AUDIO, 71
POSITION AUDIO nnn, 71
POSITION IMAGE, 71
POSITION IMAGE nnn, 71
REPEAT, 34
REPLACE n_1, 114
REPLACE $n_1 - n_2$, 114
RESUME AUDIO, 22
SHOW IMAGE, 22, 71
SHOW IMAGE nnn, 22, 71
SKIP r, 16
UN, 33
Keyboard, 5, 6
KEYBOARD, 28
Keyboard Response, 28
LABEL: c, 32
LABEL: cccc, 32
Labels, 32
Light Pen, 5, 6, 14
LIGHT PEN, 26
Light Pen Response, 26
Logical Operator Hierarchy, 41
"Looping", 124
Math Science Dictionary, 64, 66
MOVE $n_1 - n_2/n_3$, 115
Number of Cards, 120
Paragraph Indentation, 14
Pause, 17
PAUSE, 17
PAUSE n, 17
PLAY AUDIO, 22, 71
PLAY AUDIO nnn, 22, 71
POSITION AUDIO, 71
POSITION AUDIO nnn, 71
POSITION IMAGE, 71
POSITION IMAGE nnn, 71
Preparing The 1500 System for TACL Inputting, 117
Problems and Limitations, 115
Punctuation, 14
Rectangle, 2
Relocating TACL Statements, 115
Removing TACL Statements, 114
REPEAT, 34
REPLACE n_1, 114
REPLACE $n_1 - n_2$, 114
Replacement Statements, 56
Replacing TACL Statements, 114
Response Devices, 5, 6
Response Evaluation, 38
Restart Point, 15
Restrictions, 58
RESUME AUDIO, 22
Score Keeping, 56, 83
SHOW IMAGE, 22, 71
SHOW IMAGE nnn, 71, 22
Sign Off, 93
SKIP r, 16
Skipping Rows, 92
Skipping to a Row, 16
[sp], 15
Spacing after Punctuation, 14
Standard Dictionary, 64, 65
TACL, xi, 1
Tape Handling and Printed Output, 121
TACL Problems and Limitations, 87
Teaching and Coursewriting Language, xi, 1
UN, 33
Unanticipated Response, 33
Unconditional Branches, 32
Variable, 57
Variable Evaluation, 58
Vertical Lists, 11
When Finished Inputting, 93